

PRELIMINARY CATALOG OF TSUNAMIS OCCURRING IN THE PACIFIC OCEAN

By

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Prepared for

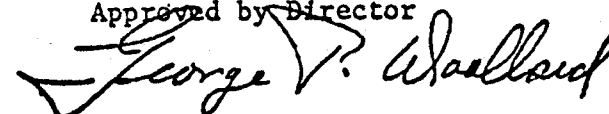
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## PREFACE

*This publication is intended to be the preliminary edition of a definitive catalog of the tsunamis of the Pacific Ocean. Included also are tsunamis in seas that are adjacent to the Pacific Ocean. We are publishing the preliminary edition and distributing it among tsunami researchers in the earnest hope that many will take the trouble to review the record as it pertains to the parts of the Pacific with which they are familiar and will let us have the benefit of their criticism.*

*Work on the catalog was begun in 1961-62 by Iida, who was then an East-West Center Senior Scholar in the Tsunami Research Program of the Hawaii Institute of Geophysics. Pararas-Carayannis, through the support of the State of Hawaii and of the International Tsunami Information Center, has since provided much of the mareographic data as well as additional bibliographic information from Hawaii. Cox and Iida, working together in 1966-67 at the Earth Science Department, Nagoya University, Japan, through the support of that Department and National Science Foundation Grant G-252, have provided additional bibliographic information. Still more information has been provided by Cox from the library of the British Museum in London and the library and files of the U. S. Coast and Geodetic Survey in Washington, D. C.*

*Both from our review of previous tsunami listings and from the checking of our own compilation, we have learned how easy it is for errors to creep into a work such as this, and how hard it is to keep them from being perpetuated. We are thus certain that, in spite of care, we have ourselves introduced some errors into the record. Further, although our search of literature and other records of tsunamis has been extensive as well as intensive, we are well aware of deficiencies that make the catalog incomplete. This we hope to remedy. The preliminary edition of the catalog is published in the belief that further work toward a definitive catalog will be more efficient if we secure the help of the community of tsunami researchers, rather than proceeding alone.*

*The number of those who have already helped us in our compilation is so large that we cannot list all of them here. However, the special help of a few should be recognized: the Librarian and the staff of the Earthquake Research Institute of Tokyo University, as well as members of the staffs of several other departments and institutes of that University, all of whom assisted greatly with bibliographic sources; Mark Spaeth, the editor of the IUGG tsunami bibliography, and other members of the staff of the U. S. Coast and Geodetic Survey who provided mareographic and bibliographic sources; the Librarian and the staff of Bishop Museum, in Honolulu; and Ethel McAfee, editor, Hawaii Institute of Geophysics, who has provided general counsel, editorial help, and, with others of the HIG staff, bibliographic services since the beginning of the project. To all, named and unnamed, we express our thanks.*

# Key to Tsunami Catalog

Column Heading	Subheading	Notation	Explanation
Date			Local date and time of tsunami generation or, if source unknown, of observation.
		*	Tsunami accepted as valid
		?	Possible tsunami
		<u>1843 April 25</u>	Gregorian date of generation of tsunami or possible tsunami, or of final observation if source is unknown: year, month, day
		1844 Mar. 2	Gregorian date of a phenomenon confused with a tsunami
		1843 IV 13	Julian date: year, month, day
		Tenpo 14 III 26	Japanese date: era, year, month, day
		III*	Extra month inserted in Japanese calendar
		(1835 Aug. 19)	Erroneous date reported for a tsunami
		06:00	Time of tsunami generation: hours, minutes (00:00-24:00 = midnight)
Earthquake Data			Data of earthquake (or eruption) associated with tsunami generation
	Time d-h-m	Mar. 28	Greenwich date
		03:36	Greenwich mean time: hours, minutes
	Epicenter	61.5 N	Latitude
		147.7 W	Longitude
	Magnitude	8.4	Earthquake magnitude
		G&R	Gutenberg and Richter (1954)
		TAO	Tokyo Astronomic Obs. (Kawasumi, 1963)
		CGS	U. S. Coast and Geodetic Survey
		CMO	Japan Central Meteorological Observatory
		JMA	Japan Meteorological Agency
		PAS	California Institute of Technology (Pasadena)

Column Heading	Subheading	Notation	Explanation
Tsunami Data	Depth (km)	33	Focal depth, in kilometers
	Region		Tsunamigenic region, as defined in Figure 1
		A	Region of origin of a tsunami or similar phenomenon
		A?	Possible region
		A*	Region in which a tsunami of unknown origin was first observed
		(A)	Region in which an erroneous report of a tsunami applies
	Generating Area		Area of origin of tsunami or similar phenomenon. Name of sea or nearby coast
	Magnitude	5	Tsunami magnitude defined by: $m = \log_2 H$ or $H = 2.0^m$ where H is the maximum runup height, in meters, measured at a coast from 10 to 250 km from the tsunami origin, and m is the tsunami magnitude. Where the necessary conditions as to a nearby coast are not met, the magnitude cannot be calculated, strictly speaking, although it may be useful to estimate the magnitude by estimating what the maximum runup height reported would be, if the necessary conditions were met.
	Place of Observation	Japan Shikoku Tosa	Places of reported observations: name of major geographic unit is shown first, followed by more precise names
	Height	3.15	Maximum runup height or amplitude, in meters
References	Δt	2	Travel time from origin, in hours
	Period	17	Period, in minutes
	Effects and Remarks		Summary of behavior and effects, discussion of data, comments on sources of information
		Heck, 1947	Author, year of publication [Note: the bibliography of the references will be issued later.]
Memoranda			Column for reader's corrections and comments



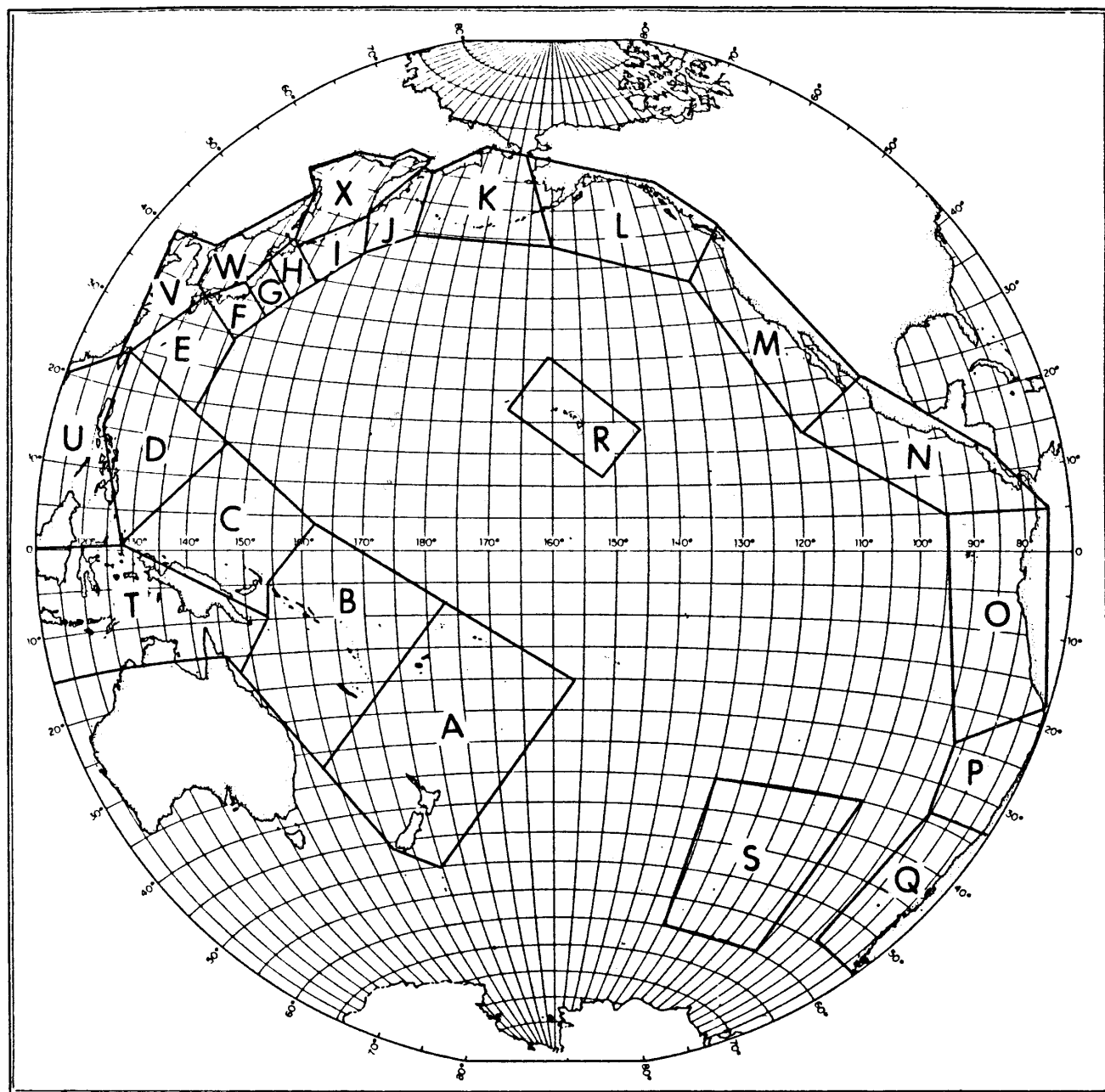


Fig. 1. Tsunamigenic regions of the Pacific Ocean.

- Region A. New Zealand, Kermadec Islands, Tonga, Samoa, Fiji
- B. New Hebrides, New Caledonia, Solomon Islands
- C. New Guinea, Bismarck Archipelago, Pacific side of Halmahera Island
- D. Philippines, Taiwan Pacific coast
- E. Ryukyu Islands, Kyushu Island
- F. Nankaido-Tokaido area (Shikoku-Sagami)
- G. Northeast Honshu Island (Boso-Sanriku)
- H. Hokaido Island
- I. Kuril Islands
- J. Kamchatka Peninsula and Komandorskiye (Commander) Islands
- K. Aleutian Islands
- L. Mainland Alaska and British Columbia
- M. Washington, Oregon, California, Baja California
- N. Mexico, Central America, North Colombia
- O. South Colombia, Ecuador, Peru
- P. North Chile
- Q. South Chile
- R. Hawaiian Islands
- S. ~~Marshall Islands~~ Marianas Islands
- T. Indonesia
- U. South China Sea
- V. East China Sea and Yellow Sea
- W. Sea of Japan
- X. Sea of Okhotsk

(Base map courtesy of J. R. Menard.)

Preliminary Catalog of Tsunamis Occurring in the Pacific Ocean

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*173 <u>June 28 to</u> <u>July 27</u>		Po 'Hai			V	Po Hai near Shantung	1?	China Laichon Bay			
*416 - -  (Oct.14) (Nov.24)		Sundu Is.			T?	Sunda Strait or Java Sea ?	2??	Indonesia, Java and Sumatra			
*684 <u>Nov. 27</u> Tenmu 12 X 14		32.5N 134.0E	8.4 TAO		F	Shikoku	4	Japan Kyushu-Tokaido Shikoku-Tosa			
*701 <u>May 12</u> Taiho 1 III 26		35.6N 135.4E	7.0 TAO		W	Tango (N. Chubu)	2 1/2	Japan W. Wakasa Bay Kamuri Is.			
?765 <u>July? _</u> Tempyo-Jingo 1 VI 5 (766 Jul. 20) (Tempyo-Jingo 2 VI 5)					E	Seikaido		Japan, Kyushu Osumi peninsula or Osumi Island			
?799 <u>Sept. 18</u> Enryaku 18 VIII 11					G	Dist. from Sharaki E. Honshu, Japan		Japan - Hitachi, E. Honshu	2±		
*818 <u>Aug. ?</u> Konin 9 VII _		35.2N 139.3E	7.9 TAO		F	Tokaido, Sagami Bay	1	Japan Sagami Bay			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Observed in three countries.</p> <p>May be Indian Ocean tsunami.</p> <p>800 m Inundation Great tsunami. Many houses damaged. 12km<sup>2</sup> of land sank with two villages. Gondo in his summary table but not his text confuses the Izu effects of this tsunami with those of an XI mo. storm surge at Tosa and lists a "kaisho" as well as the quake on the XI<sup>4</sup> date at Kyoto and various unnamed provinces. Sieberg gives the uncorrected Japanese date; Imamura uses the Nov. 24 date; all other authors Nov. 29.</p> <p>Subsidence. Village left under water.</p> <p>At Shinzo Shinto. Volcanic eruption. Rapid shaking. Island sank by some reports. A number of people swept away. Probably a mud flow, not a tsunami. Gondo gives earlier year; Musya and Arakawa later.</p> <p>Pbs. at Kashima, Naka, Kuzi, and Taka. Imamura considers this a distant tsunami, Kawasumi considers it associated with a probable Sanriku quake. Considering the season it seems just as likely to have been a storm surge.</p>	<p>Keimatsu, 1963</p> <p>Wichmann, 1918 Heck, 1947</p> <p>Honda, a.o., 1908 Omori, 1913 Gondo, 1932 Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Musya, 1941 Imamura, 1949 Iida, 1956</p> <p>Gondo, 1932 Musya, 1941 Arakawa, 1964</p> <p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Jan. 27) *350 Nov. 27 Kashu 3 X 16		39.1N 140.0E	7.9 TAO		W	W. Tokoku	1	Japan Shonai, Dewa (W. Tokoku)			
?855 June ? Seiko 2 V .					F			Japan Ku-Kumano			
(Jul. 9) *869 July 13 Jogan 11 V 26		38.5N 143.8E	8.6 TAO		G	Sanriku	5	Japan, Sanriku Mutsu (now Iwaki, Iwashiro, Rikuchu and Mutsu)			
*887 Aug. 2 Ninna 3 VII 6		37.5N 138.1E	6.5 TAO		W	W. Echigo (Niigata Pref.)	1	Japan Kukiki Echigo (Niigata Pref.)			
*887 Aug. 26 Ninna 3 VII 30		33 N 135.3E	8.6 TAO		F	Kii Strait	4	Japan Honshu-Settsu (Osaka)  Shikoku			
*922 -- -- Engi 22 -- --		33.8N 136.7E	7.0 TAO		F	Kumano Sea	1	Japan Kumano			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Date is uncertain. Musya gives no date. Jan. 27 date given by Honda and by Omori is incorrect conversion of XI 16 given by Omori for tsunami and by Kawasumi for quake only.</p>	<p>Honda, 1908 Omori, 1913 Musya, 1941 Iida, 1956</p>	
<p>No details. No quake described. Distant tsunami or storm surge.</p>	<p>Musya, 1951</p>	
<p>Following earthquake, sea rushed inland along several hundred km of coast. About 1,000 deaths. Hundreds of villages ruined. Considered by Imamura to be, with tsunami of 1611 Dec. 2, largest of Sanriku history. Date given incorrectly as Jul. 9, by Davison (1936), and Heck, and as Jul. 2 in Ofunato-shi publication (Anon 1962).</p>	<p>Omori, 1908 Anon, 1935 (Miyagi Pref.) Imamura, 1934 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>Numerous deaths.</p>	<p>Honda, 1908 Musya, 1941 Iida, 1956 Kawasumi, 1963</p>	
<p>Many deaths.</p>	<p>Honda, a.o., 1908 Gondo, 1932 Musya, 1941 Iida, 1956 Kawasumi, 1963</p>	
<p>Many deaths.</p>	<p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1076 Oct 31		Kwantung			U	S. China Sea		China Chao Yang, Kwantung			
1092 Sept ? Kanji 6 VIII 3					W			Japan Echigo (Niigata Pref.)			
*1096 Dec 17 Eicho 1 XI 24		34.2 N 137.3 E	8.4 TAO		F	Tokaido Enshu Sea	2 1/2	Japan, Tokaido 7 Ise Suruga			
(1240 May 22)					(F)						
*1241 May 22 Ninji 2 IV 3		35.2 N 139.3 E	7.0 TAO		F	Tokaido, Sagami Bay	1	Japan, Sagami, Tokaido Kamakura Yuigahama			
*1257 Oct 9		Rikuchu			G	Sanriku	1	Japan, Rikuchu, Sanriku 1. Kuji and Noda			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
Dubious tsunami. Probably storm surge.	Keimatsu, 1963	
Storm surge. Many fields and houses inundated. Many deaths. Gondo, who gives complete date, says Ise also was affected. Imamura gives only year and Musya only era.	Musya, 1941 Imamura, 1949	
More than 400 deaths.	Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963	
See 1241 May 22.	Sekiya and Omori, 1904 Honda, a.o., 1908 Heck, 1947	
Tsunami swept shrine. More than 10 boats wrecked. Year given incorrectly as 1240 by Sekiya and Omori (1904), Heck (1947), and Honda, a.o., (1908).	Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963.	
No details. The earthquake generating this tsunami has been confused by Iida (1956) and Kawasumi (1963) with a larger quake on the same day causing damage at Kamakura, Tokaido, Japan. Date of Tsunami translated incorrectly from Japanese calendar to 9 Dec. by Watanabe (1964).	Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963 Watanabe, 1964	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(1293 _ _)					(G?)			Japan			
(1360 July ?_) (Aug. ?_) (Shohei 15) Enbun 5 (VI 20) (VII 24)		Nankaido	8.1		(F)	Nankaido		Japan - Nankaido			
*1360 Nov. 22 Shohei 15 X 5 (Nov. 23) (X 6)		33.4 N 135.2 E	7.0 TAO		F	Nankaido, Kii, Kumano	2 1/2	Japan Kii, from Settsu (Hyogo) to Owase			
*1361 Aug. 3 Shohei 16 = Koan 1 VI 24		33.4 N 135 E	8.4		F	Nankaido	4	Japan Nankaido Settsu (Hyogo) Yukiminato, Tokushima Naruto Strait			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Report by Daly, copied by Heck, of a tsunami causing 30,000 deaths is not corroborated by any Japanese author and is certainly mistaken.</p> <p>The quake and all of the effects of the Nankaido tsunami of Shokei 16 VI 24 are listed by Gondo as occurring on two dates approximately a year earlier. The primary source of confusion was probably the coexistence of two rulers and hence two era systems, in one of which the era name was changed partway through one of the years. One of the dates Gondo used was that of the beginning of the quake series, VI 20 in place of the date of the quake associated with the tsunami VI 24. The other date was incorrect by one month, VII 24. See 1361 Aug. 3.</p> <p>Damage and numerous deaths. A first quake occurred 21 Nov. The tsunami was associated with a second quake about midnight 22 Nov. (Musya's date) and reached shore early on 23 Nov. (Imamura's date).</p> <p>Action especially marked. Sea receded for about an hour before returning. Several hundred deaths. Great loss of life. 1700 houses washed away. Effects ascribed by Gondo, to previous year. See (1360 Jul.?~ Aug.?)</p>	<p>Daly, 1926 Heck, 1947</p> <p>Gondo, 1932 Musya, 1941</p> <p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Honda, a.o. 1908 Omori, 1913 Imamura, 1933 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	Δt	Period
*1403 Dec. ? = Oei 10 --		33.7 N 136.5 E	7.0 TAO		G	Nankaido, Kii	1	Japan Kii			
1407 Aug. 23 Oei 14 VII -					V			Korea Haeju			
*1408 Jan. 21 Oei 14 XII 14		33.8 N 136.9 E	7.0 TAO		G	Nankaido, Kii	1	Japan Kii			
1420 Sept. 6 Oei 27 VII 20					G*	Unknown	?	Japan Hitachi, Kanto			
*1433 Nov. 7 Eikyo 5 IX 16		34.9 N 139.5 E	7.1 TAO		G	Tokaido, Sagami	1	Japan Sagami			
1434 Aug. 6 Eikyo 6 = Lee- Seiso 16 VII 2					V			Korea Inchon			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>No details. No quake described. Probably storm surge.</p>	<p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Musya, 1951</p> <p>Honda, a.o. 1908 Milne, 1912 Omori, 1913 Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>Nine waves in 4 hrs. Imamura estimated height in order of 2m. No information on quake so tsunami assumed of distant origin.</p>	<p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>Tone River reversed direction.</p>	<p>Musya, 1941 Iida, 1956</p>	
<p>Damage to rice fields. No quake. Storm surge according to Imamura.</p>	<p>Musya, 1941 Imamura, 1949</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1495 Sep. 12 Meio 4 VIII 15		35.5N 139.2E			G	Tokaido, Sagami	2 1/2	Japan Kamakura, Sagami			
(Jul. 9) *1498 Sep. 20 Meio 7 VIII 25		34.1N 138.2E	8.6 TAO		G	Nankaido, Kii	4	Japan-Honshu Kii to Sagami  Ise-Ominato  Kamakura			
1500 Jul. 10					F			Japan-Tokaido Totomi, Enshunada			
1509 Jun. 17 to Jul. 16		Near mouth of Yangtze			V	Yellow Sea	0?	China Chiating, Hsien, Lotien Chen, and Paoshan Hsien, at mouth of Yangtze R.			
(1510 Sept. 20) (Eisho VIII 7) * 1510 Sep. 21 Eisho 7 VIII 8		34.6N 135.7E	6.7 TAO		G	Settsu (Osaka Bay)	0	Japan Settsu (Osaka) Kawachi			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Tsunami destroyed shrine near Daibutsu. 200 deaths.</p> <p>Waves recorded at Ise, Mikawa, Suruga, Sagami, Izu.</p> <p>1000 houses washed away. 5000 deaths.</p> <p>Waves reached Daibutsu temple. 200 deaths. Milne lists Japanese tsunamis on two dates in 1498, Jul. 9 and Sept. 20. The earlier date was that of a quake in Kyoto but occurrence of a tsunami cannot be confirmed from Japanese sources and probably represents a variant of the Sept. 20 report.</p>	<p>Gondo, 1932 Musya, 1941 Imamura, 1949 Iida, 1956</p> <p>Honda, a.o., 1908 Milne, 1912 Omori, 1913 Gondo, 1932 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>Report by Milne cites Sekiya and Omori as source. However Sekiya and Omori (1904) list for this date only a strong inland quake in Yamanachi Prefecture.</p>	<p>Milne, 1912 Heck, 1948</p> <p>Keimatsu, 1963</p>	
<p>Some houses destroyed.</p> <p>Gondo uses date one day earlier than other authors.</p>	<p>Honda, 1908 Omori, 1913 Gondo, 1932 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Oct. 1) ?1510 Oct. 10 Eisho 7 VIII 27					F			Japan-Tokaido Totomi, Enshunada			
1512 Oct.? ____ Eisho 9 VIII ____					F			Japan, Shikoku Shikoku-Awa Shishikuiuru (Tokushima)			
1519 Sep. 24 Lee-Chuso 16 VIII —					V			Korea Chuseido coast (N. of Kursan)			
*1520 Apr. 4 Eisho 17 III 7		33.6N 136.3E	7.0 TAO		F	Nankaido, Kii	1	Japan Kii			
(1521 Oct.? ____) (Eisho 9 VIII 4)					(F)						
?1537 ____					Q			Mexico			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>High water breached barrier beach to lagoon. No quake. Imamura considers a storm surge. Milne gives erroneous date of Oct. 1.</p>	<p>Honda, a.o., 1908 Milne, 1912 Musya, 1941 Heck, 1947 Imamura, 1949 Kawasumi, 1963</p>	
<p>Inundation drowning more than 3700. No earthquake. Probably a storm surge although Imamura (1949) (which misprints reported date as 1521) considers reference to 1605 Jan. 31 tsunami.</p>	<p>Musyu, 1941 Imamura, 1949</p>	
<p>No details. No quake noted. Probably a storm surge.</p>	<p>Musya, 1941</p>	
<p>Some houses washed away.</p>	<p>Musya, 1941 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>Misprint. See 1512 Oct. ?__.</p>	<p>Imamura, 1949</p>	
<p>No details known. Report is considered quite questionable because it is carried by no authorities outside Japan.</p>	<p>Anon, 1961 (JMA) Kawasumi, 1963</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1545 Feb. 7</u> Tenbun 13 XII 16 (Feb. 17) (XII 26)					F						
<u>?1556 Oct. 21</u> Koji 2, Lee- Meiso II IX 7		Korea			W or V	Japan Sea or Yellow Sea		Korea Seikidon, Isan, Anson, and Keikido (W. Coast)			
(June 15) (July 25) <u>?1562 July 26</u> Eiroku 5 VI 15					V	?		Japan, W. Kyushu Yatsuhiro, Higo			
<u>*1562 Oct. 28</u> 05: _ ~ 06: _		Chile 37 to 39S			Q	Chile, Conception to Valdivia	4?	Chile Conception to Valdivia			
<u>*1570 Feb. 8</u> 09: _		Chile 36 to 38S			Q	Chile Conception	2?	Chile Conception (Fenco)			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Imamura, who used later date for this reported event, considered this report referred actually to the 1605 Jan. 31 tsunami. However, according to Musya, the event actually took place on the earlier date when a quake was reported at Izu.</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>No details. No quake noted. Imamura considers a possible storm surge.</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>No record of earthquake. Possibly tsunami of distant origin but more likely a storm surge. June date given by Iida is Japanese calendar date. Musya (1941), Imamura, Honda, and Heck use July 25 date. However, Musya gives probably corrected date of Jul. 26 in his summary table (1951).</p>	<p>Honda, a.o., 1908 Heck, 1947 Imamura, 1949 Iida, 1956</p>	
<p>Effects along 1500 km of coast N. and S. of Conception. Much loss of life.</p>	<p>Montessus De Ballore, 1911, 1912a Milne, 1912 Sieberg, 1932 Bobillier, 1933 Heck, 1947 Horikawa, 1961 Berninghausen, 1962</p>	
<p>Very severe tsunami. Sea withdrew and returned, (Montessus De Ballore uses Feb. 9 in provisional list of 1910(b) but elsewhere gives date as Feb. 8 as other authors.)</p>	<p>Anonymous, 1877 Milne, 1912 Montessus De Ballore, 1912a Sieberg, 1932 Bobillier, 1933 Heck, 1947 Horikawa, 1961 Berninghausen, 1962 Kawasumi 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	Δt	Period
(Mar. 17) (Dec. 6) *1575 Dec. 16		Chile 39~41S			Q	Chile	2?	Chile Conception Imperial - Castro Valdivia			
1580 Jan. ? Tensho 7 XII _					W			Korea Kogendo (E. Coast)			
?1585 June 11 (June 21) Tensho 13 V 14					G* ?	Unknown		Japan, Sanriku Rikuzen - Motoyoshi Co.			
?1586 Jan. 18 Tensho 13 XI 29 (Tensho era)		36 N 136.8 E	7.9 TAO		F?  W??			Japan Kinki - Kii Rinki - Chubu - Ise Sea Chubu - Hokuriku			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>No waves noted.</p> <p>Intense wave in Bahia Corral. Two galleons wrecked. Montessus De Ballore gives date of Dec. 6, perhaps as a misprint in a 1912(a) listing, but uses Dec. 16 in provisional lists (1910-11b) and detailed discussions. (1911a) Sieberg uses Dec. 6 date. Horikawa uses March 17, which is the date of a quake at Santiago without a tsunami.</p> <p>No details. No quake noted. Distant tsunami or storm surge.</p> <p>Kaisho legend in Togura village which gives incorrect western date of Jun. 21. Imamura identifies as distant tsunami if valid. Miyagi Prefecture (Anon., 1903, 1935) suggest it may be misdated observation of Tokaido tsunami of 1586 Jan. 18. Kunitomi erroneously described the latter event as the subject of the legend and lists the former as if without question. Japan Meteorological Agency (Anon., 1961) suggests the legend may refer actually to the Peru tsunami of 1586, which would have arrived Jul. 10 or 11.</p> <p>? The large quake in central Honshu, which was accompanied by a very large landslide, was well documented. The tsunami reports are confusing. Sekiya and Omori (1904) mentions a violent tsunami attacking coastal areas affected by the quake; Honda, a.o. lists a tsunami in Central Honshu; and Musya (1941) and Gondo refer to reports of a tsunami affecting various coastal areas on the date of the quake, but none specify which coast was affected. Omori (1913) briefly mentions both a violent tsunami at Hokuriku (Japan Sea) and a tsunami which was especially strong on the coast of Ise (Pacific), without notice of the remarkable coincidence implied. Musya also quotes a report of a tsunami at Hiromura</p>	<p>Montessus De Ballore, 1911a Milne, 1912 Sieberg, 1932 Bobillier, 1933 Heck, 1947 Horikawa, 1961 Berninghausen, 1962</p> <p>Musya, 1951</p> <p>Anon, 1903 (Miyagi) Kunitomi, 1933 Imamura, 1949 Musya, 1941 Iida, 1956</p> <p>Sekiya and Omori, 1904 Honda, 1908 Omori, 1913 Gondo, 1932 Musya, 1941 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1586 July 9 (June 9)		Peru, near Lima			0	Peru, near Lima	4?	Peru Lima Trujillo	26m		
(1586 Sept. _)						?		Japan Inland Sea Nangasuma (Nagashima ?)			
*1596 Sept. 1 Keicho 1 VII* 9 Sept. 4 VII* 12		33.3 N 131.7 E	6.9		E	Kyushu	2 1/2	Japan, Kyushu, Beppu  Uryu-jima			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>and Tatsugahuma (places apparently in Wakayama Pref., Kii) in the Tensho era (1573-1596) which, however he considers as referring properly to the 1605 Jan. 31 tsunami (Keicho 9), implying that he considers there was no Tokaido-Nankaido tsunami in the Tensho era. Imamura (1949) listed no tsunami associated with the 1586 Jan. 18 quake. However, it seems possible that there were some Tokaido-Nankaido tsunami effects, even though the quake center was inland. It seems less likely that there were such effects on the Japan Sea Coast. (See also 1585 Jun. 11).</p> <p>Shore inundated for 10 km inland. Destructive. (Geogr. Mag. (Anon, 1877) lists date as Jun. 9)</p> <p>Ruined according to Mallet, who cites Kaempfer, 1777. Neither this German edition of Kaempfer nor an English edition of 1727 support the report, however, and the tsunami is not reported in Japanese sources. Hence the report is considered erroneous.</p> <p>Three waves. Two villages (70 to 80 houses) submerged. 708 deaths. Island subsided and almost disappeared. Musya (1941) originally used the date VII* 12 = Sep. 4, which was also used by Imamura and by Heck, but later corrected it to VII* 9 = Sep. 1 which is date used by Honda and Omori. The correction was apparently overlooked in the compilation of Musya's summary (1951).</p>	<p>Mallet, 1853 Anon., 1877 Sieberg, 1932 Heck, 1947 Berninghausen, 1962</p> <p>Mallet, 1853 Heck, 1947</p> <p>Honda, a.o., 1908 Omori, 1913 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963.</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1602 Jan. ? Keicho 6 XII 16		Japan, Boso Penin.			G	Boso	1	Japan, Chubu Kazusa and Awa (Boso)			
?1603 - Keicho 8 - -					F			Japan Kii-Kumano			
*1604 Nov. 24 12:13		Peru- Chile 16 - 20 S near Arequipa			O	Peru, Arequipa to Chile, Anca	4?	Peru-Chile Arica Pisco (?)			
*1605 Jan. 31 Keicho 9 XII 16 (Feb. 3) (Keicho 10 XII 16) 20: -		34.3 N 140.4 E	7.9		F	Japan Nankaido-Tokaido	5	Japan  Shikoku Tosa Awa (Tokushima) Honshu Izu Ise Enshu Coast Boso  Osaka Bay Hachijo-jima		2 hrs. ±	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Landslide into sea. Tide retreated 300 m. Returned next day (?). Many men and beasts drowned.</p>	<p>Gondo, 1932</p>	
<p>No details. No quake noted. Distant tsunami or storm surge.</p>	<p>Musya, 1951</p>	
<p>Tsunami observed for 1500-2000 km along coast. City inundated and almost destroyed. Moved afterward to a higher level.</p>	<p>Montebessus De Ballore, 1911a Sieberg, 1932 Bobillier, 1933 Heck, 1947 Horikawa, 1961 Berninghausen, 1962</p>	
<p>Great Keicho Nankaido-Tokaido tsunami. Observed from Satsuma (Kyushu) by Boso (Honshu).</p>	<p>Honda, a.o., 1908 Milne, 1912 Omori, 1913 Gondo, 1932 Heck, 1947 Musya, 1951 Iida, 1956 Kawasumi, 1963</p>	
<p>Great tsunami. Seven waves. 3806 deaths at Shishikui. Recession first. (See 1512 Sep.-Oct.)</p>		
<p>? (See 1512 Sep.-Oct.) Large tsunami. Sea receded 2 m before advance Strong tsunami. Greatest intensity at SE Boso. Nearly 1 km<sup>2</sup> exposed by initial withdrawal of sea. No waves observed. Houses wrecked and washed away. 56 deaths.</p>		
<p>Jan. 31 date is given by Milne, Omori, Musya (1941), Imamura and Kawasumi. Feb. 3 given by Musya (1951) and Heck (1944) represents an incorrect calendar conversion. Although Honda a.o. give the correct Gregorian date they use the Japanese year Keicho 10, apparently as a result of confusion with the event of 1606 Jan. 23 (which see). There is some confusion of effects of the two events in Musya and the other authors also.</p>		



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1606 Jan. 23</u> Keicho 10 XII 15		Volcanic eruption Hachijo I.			F	Izu Is.		Japan, Izu Is. Hachijo I.			
<u>*1611 Dec. 2</u> Keicho 16 X 28 (XI 30?)		38.2 N 143.86	8.1 TAO		G	Sanriku	5	Japan  Rikuzen Iwanuma Rikuchu Yamada Taro S. E. Hokkaido	25 25		
<u>*1614 Nov. 26</u> Keicho 19 X 25 (Nov. 28)		37.5 N 138 E	7.7 TAO		W	N. W. Honshu	1	Japan, N. W. Honshu, Echigo, Kubiri, Takada			
<u>*1615 Sept. 16</u> 20: _		Chile, Arica			P	Arica	2?	Chile Arica			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>"Flood wave" accompanying eruption. Reference to "nankai" (south sea) of Hachijo is apparent source of confusion with major Nankai tsunami of previous year, which had effects at Hachijo. However there seems to have been a small tsunami at Hachijo in this year also.</p> <p>Great Keicho Sanriku tsunami. Observed from Sendai to S. E. Hokkaido. Considered by Imamura to be with Teikan tsunami (869), largest in history of Sanriku. 1783 casualties in Date dominion. Waves swept 4 km inland. Boats driven ashore. 3000 men and horses drowned in Nambu and Tsugoru dominions. Flooded to 1.2 km. (2.1 km to S.)</p> <p>Some deaths by drowning. The last day of XIth month is given by Miyagi Prefecture (1903) and by Kunitomi (1933) for some of the effects of this tsunami and by Gondo as an alternate date. Other authors use the date of X 28. An event listed in the Miyagi Prefecture (1903) list of tsunamis under the date of VIII -- was just a quake, and a misprint in Gondo's summary result in some confusion with inland quakes on VIII 21 and IX 11.</p> <p>Numerous deaths. Milne uses Nov. 28 date.</p> <p>Waves caused no damage but city destroyed by earthquake.</p>	<p>Gondo, 1932 Musya, 1941</p> <p>Anon, 1903 (Miyagi) Honda, a.o., 1908 Milne, 1912 Omori, 1913 Gondo, 1932 Imamura, 1934 Anon, 1935 (Miyagi) Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963 Watanabe, 1964</p> <p>Honda, a. o., 1908 Milne, 1912 Omori, 1913 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Montessus De Ballore, 1911a Bobillier, 1933 Heck, 1947 Horikawa, 1961 Berninghausen, 1962</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1616 Sept. 9 Genna 2 VII 28	11: _	38.1 N 142 E	7.0 TAO		G		1	Japan, Sanriku Rikuzen - Sendai			
(Oct. 23) *1616 Dec. 6 Genna 2 X 28		Japan Sanriku			G		1?	Japan, Sanriku Rikuchu			
*1627 Sept. _		16 N 121 E			D	N. Luzon	2?	Philippine Is. Cagayan (N. Luzon)			
*1629 Aug. 1		Banda Is.			T	Banda Is.	4?	Indonesia Banda Neira	15	0.5 hr.	
(1630 _ _ _ or 1631 _ _ _)					T	Banda Is.		Indonesia Banda Neira			
*1633 Mar. 1 Kanei 10 I 21		35.6 N 139.2 E	7.1 TAO		F	Sagami Bay	1	Japan, Tokaido Atami			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Small Tsunami. Imamura (1933) locates this tsunami at Rikuchu, apparently confusing it with that of Dec. 6.</p> <p>Tsunami and quake occurred at time of a fair in Yokamachi. Several hundred deaths there and in Kamaishi and Otsuchi. Oct. 23 date given on Ofunato-shi publication (Anon, 1960) refers to old calendar.</p> <p>Waves inundated one league inland. Trees uprooted. See also 1638.</p> <p>Damage to mole and vessels. Heavy masses of iron washed about. Indonesian tsunami reported by Mallet (1854) is probably same event. Sieberg gives place as Banda Neira and gives At. Heck gives other details.</p> <p>Quite probably same as 1629 Aug. 1. Heck copied both dates in his list.</p> <p>Houses and fishing gear washed away.</p>	<p>Imamura, 1934 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963 Watanabe, 1964</p> <p>Musya, 1941 Anon, 1960 (Ofunato-shi)</p> <p>Repetti, 1946</p> <p>Wichmann, 1918 Sieberg, 1932 Heck, 1947</p> <p>Mallet, 1853 Heck, 1947</p> <p>Honda, a.o., 1908 Musya, 1941 Heck, 1947 Iida, 1956</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1636 July 31 Kanei 13 = Lee- Uinso 14 VI 29					W			Korea Torai (Near Pusan)			
(1638 _ _)					(D)	N. Luzon		Philippine Is. Camarines			
(Kanei 17 VI 12) *1640 July 31 Kanei 17 VI 13		Volcanic eruption Komaga- take, Japan			H	Uchiura Bay	1	Japan, Hokkaido Uchiura Bay  East Tokachi			
*1640 Sept. 16 to Nov. 14		23 N 117 E			V	S. China Sea	1?	China, Kwantung Chenghai, Chuoyang, and Chieyang			
(July 24) *1643 July 25 Kanei 20 = Lee- Jinso 21 VI 10)		Korea Str.			W	S. E. tip of Korea	1	Korea Keshodo (about 60 km N. of Pusan)			
1645 Dec. 5 23:00		Near Manila			U	Manila Bay?		Philippine Is. Luzon - Manila			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>No details. No quake noted. Possible storm surge according to Imamura.</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>According to Repetti this report refers actually to the tsunami of 1627 Sep. at Cagayan.</p>	<p>Nieremberg, 1635 Perrey, 1860 Repetti, 1946</p>	
<p>Disastrous tsunami with beginning of eruption of Komagatake. 700 persons drowned, many on boats collecting seaweed. 20 houses washed away. Observed.</p>	<p>Imamura, 1934 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Watanabe, 1964</p>	
<p>Earthquake and tsunami.</p>	<p>Keimatsu, 1963</p>	
<p>Tide oscillation after earthquake. Jul. 24 date is given by Musya, 1941. Jul. 25 is given in Musya summary (1951) and by Imamura.</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>River agitated and overflowed. Probably a seiche rather than a tsunami from the bay.</p>	<p>Repetti, 1946</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicerter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>1647 May 7</u>					O*	Unknown		Peru Callao			
1649 July 30 Keian 2 June 21		36.1 N 139.7 E	7.1		F			Japan Tokyo			
*1649 Dec. 9 Keian 2 = Lee- Jinso 27 XI _		Near Banzan			V	Yellow Sea, S. W. Korea	1	Korea Zenrado prov.			
(Oct. 31) 1650 Dec. 13 Keian 3 X* 20					W			Japan Echizen (Fukui Pref.)			
?1651 _ _ Keian 4 _ _					G*	Peru - Chile ?		Japan, N. E. Honshu Miyagi, Watari			
?1653 July _ 00:00		Mindoro I. ?			U	Sibuyan Sea ?		Philippine Is. Mindoro I.			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Unusual waves reported in connection with records of a major Santiago quake on May 13.</p> <p>Seismic wave according to Sieberg. No Japanese authorities cite tsunami associated with this quake and Kawasumi (1963) location, is inland.</p> <p>Six villages affected.</p> <p>According to Imamura this was a storm surge. Date of Oct. 31 given by Iida was result of erroneous calendar conversion.</p> <p>By oral tradition a tsunami occurred. Japan Meteorological Agency (Anon, 1960) considers this a distant tsunami and attributes it to South American origin, although Imamura considers it a possible storm surge. Milne (1912) lists a large Peru-Chile quake in this year but does not mention waves.</p> <p>Anchored galleon set adrift by breaking waves that were caused by an earthquake according to one historical account. Repetti points out that the quake was not mentioned but that three typhoons were mentioned in other accounts. The occurrence of a tsunami is, therefore, considered very doubtful.</p>	<p>Montessus De Ballore, 1912a</p> <p>Sieberg, 1932</p> <p>Musya, 1941 Imamura, 1949</p> <p>Imamura, 1949 Iida, 1956</p> <p>Musya, 1941 Imamura, 1949 Anon, 1961 (JMA)</p> <p>Repetti, 1946</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	Δ t	Period
*1657 Mar. 15 19:30		Chile, inland near Santiago			Q	Santiago - Conception	3?	Chile Santiago Conception (Penco)		2 hrs.	
?1661 Jan. 8 or Jan. 9					D?	?		Taiwan			
?1662 Oct. 20 Kanbun 2 IX 9		Rikuchu			G	Sanriku	0	Japan, Rikuchu			
(Oct. 30) (IX 19) *1662 Oct. 31 Kanbun 2 IX 20 (X _)		31.7 N 132 E	7.6 TAO		E	S. E. Kyushu	2 1/2	Japan Kyushu Hiuga-Naka S. Miyazaki Osumi (Kugoshima) Beppu Chubu Izu Asahi (Kamo County)			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>High waves. Tsunami arrived 2 hours after shock. City inundated by 3 big waves destroying everything left by earthquake. Few casualties.</p> <p>Sea violently agitated, ships dashed about. Perhaps a sea quake.</p> <p>Quake and tsunami reported in a single account. Perhaps a very local tsunami, although Musya and Imamura cast doubt on occurrence.</p> <p>About 30 km of coastline inundated. 1213 houses destroyed including 246 submerged. 15 deaths. Many deaths. Land submerged. 10 cargo boats wrecked and rice cargo lost. 5 deaths. Undated tsunami listed in chronical of Izu Peninsula is probably this event. Quake occurred in the night of Oct. 30 (Musya, 1941 and main summary table, 1953, and Omori) or in early morning hours of Oct. 31 (Musya brief summary table, 1953, and Kawasumi). Gondo notes a ms. chronicle date of X __ for the effects at Osumi which he corrects to IX 19.</p>	<p>Montessus De Ballore, 1912a Milne, 1912 Bobillier, 1933 Heck, 1947 Horikawa, 1961 Berninghausen, 1962 Kawasumi, 1963</p> <p>Mallet, 1852 Milne, 1912 Heck, 1947</p> <p>Musya, 1941 Imamura, 1949</p> <p>Omori, 1913 Gondo, 1932 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1664 -- -- Kanbur. 4 -- --		Torishima volcanic eruption			V	Amami Is.	1?	Ryukyu Is. Ryukyu-Torishima			
?1666 May 31 Kanbun 6 IV 28		Edo (Tokyo)			F	Ise Bay?	1	Japan-Chubu Chita Pen. (Ise Bay)			
*1668 Jul. 31 Kanbun = Lee- Konso 9 VI --		Korea W. Coast			V	Korea W. Coast	1?	Korea (W. Coast) Heiando and Tetsuzan (Korea Bay)			
*1670 Aug. 19		Near Shanghai			U	East China Sea	1?	China Chiating, Lutienchen and Pau shan (Village on S. shore of S. distributions of Yangtse Kiang).			
1670 Sep.? -- Kanbun 10 VIII 23					F	Osaka Bay		Japan-Kinki Settsu (Osaka)			
*1673 May 20		Near Halmahera			T	Halmahera	1?	Indonesia Halmahera Is.			
?1673 Jul. 12		Amboina, Moluccas			T	Molucca Is.		Indonesia Moluccas, Ambcina			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
Houses damaged and some deaths. Wave accompanying submarine eruption.	Gondo, 1932 Musya, 1941	
Damage. Imamura reported this as a probable storm surge, but storm surges are very rare in May. There was an earthquake on this date but it was centered at Edo (Tokyo).	Musya, 1941 Imamura, 1949 Kawasumi, 1963	
No details.	Musya, 1941	
Earthquake followed by tsunami. Many drowned.	Keimatsu, 1963	
Storm surge.	Gondo, 1932	
Moderate tsunami.	Wichmann, 1918 Heck, 1947	
No details. Possibly same as 1673 Aug. 12 but location is different as well as date.	Sieberg, 1932	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicerter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1673 Aug. 12					T	Molucca Passage	1?	Indonesia Ternak Is.			
(Feb. 12) *1674 Feb. 17		Near Amboina			T	Banda Sea	2?	Indonesia Amboina Hitu Other nearby is.			
*1674 May 6		Near Amboina			T	Banda Sea	1?	Indonesia Hitu			
?1675 Feb--		N. Mindoso W. Luzon			U	China Sea	1?	Philippine Is. Mindozo Luzon, Batangos			
*1676 Nov? -- Enpo 4 X _					G*	Unknown	?	Japan Iwaki Hitachi Mitsu ?			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Wave of considerable force.</p>	<p>Wichmann, 1918 Heck, 1947</p>	
<p>Moderate tsunami High runup causing some loss of life. 3 waves. Smaller waves. Sieberg (who gives date as Feb. 12) puts loss of life at 2243 and mentions only Amboina. Heck discriminates between effects at various places.</p>	<p>Wichmann, 1918 Sieberg, 1932 Heck, 1947</p>	
<p>Moderate waves.</p>	<p>Wichmann, 1918 Heck, 1947</p>	
<p>Subsided. Waves reported by Sieberg without details. Saderra (1895) and Repetti (1946) do not mention wave activity.</p>	<p>Sieberg, 1932</p>	
<p>Houses washed away and people and animals drowned. Report is confusing. Miyagi Pref. (Anon, 1903, 1935) give places as Hitachi-no-kuni Mito and Mutsu-no-kuni Iwaki. Iwaki is a separate province next to Hitachi but far from Mutsu (Komon). Kunitomi lists the three provinces, Hitachi, Iwaki, and Mutsu as does Musya in his summary (1951), although in his detailed report, which cites Miyagi Pref., he omits Mutsu. Probably a tsunami of distant origin.</p>	<p>Anon, 1903, 1935 (Miyagi) Kunitomi, 1933 Musya, 1941 Iida, 1956</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1677 Apr. 13 Enpo 5 III 12		38.7 N 144 E	8.1 TAO		G	Sanriku	2 1/2	Japan, Sanriku Rikuchu Otsuchi Kuwagasami Miyako		2	
*1677 Nov. 4 Enpo 5 X 9		36.6 N 141.5 E or 34.7 N 141.2 E	7.4 TAO		G	Kashima or Boso	2 1/2	Japan Tokaido-Sanriku  Kii Owari (N. W. Ise Bay) Iwaki-Onahama Rikuzen-Iwanuma Hachiyo Is.			
*1677 Dec. 7 19:30		Central & North Luzon			V	China Sea	1?	Philippine Is. Central & N. Luzon			
*1678 June 17		Peru N of Lima			O	N. Peru	2?	Peru Santa			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
Inundation 600 m inland. Twenty houses damaged.  Three large waves in 4 hours starting midnight.	Honda, a.o., 1908 Milne, 1912 Omori, 1913 Imamura, 1934 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963	
Seismic center placed in Kashima Sea by Watanabe and off Boso by Kawasumi. Many aftershocks reported on Boso Penin. Tsunami effects reported from Kii to Rikuzen.  24 or 25 fishing boats wrecked. 80 deaths by drowning. 490 homes washed away. 123 deaths. 10 fishing boats washed away. High runup at Tanigasato.	Gondo, 1932 Musya, 1941 Imamura, 1949 Iida, 1956	
Sea waves at some places. Boats at sea almost submerged.	Repetti, 1946	
Sea receded and later returned with destructive violence. (Milne reported a 24-hour lag) Ship carried far inland. Heck follows Milne in the use of what may be an old place name, Santa. Sieberg gives an alternate date of Jan. 8.	Mallet, 1853 Anon, 1877 (Geogr. Mag.) Milne, 1908 Sieberg, 1932 Heck, 1947 Berninghausen, 1962	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1680 Sept. 28 Enpo 8 VIII 6 (Sept. 29)		Enshu- nada			F	Enshu-nada	2	Japan, Chubu Totomi (Enshu-nada) Iwata Co - Fukushima			
1681 June 12 Tenna 1 IV _		Central Korea			W	Korea, E. Coast		Korea, E. Coast Yanyan and Sanchok			
(1681 June 26) (Tenna 1 V _)		Central Korea?			(W)			Korea Vic. of Yanyan			
?1686 _ _					P	Chile?		Chile			
1687 July 26 Tokyo 4 VI 18					W			Japan, N. Kinki - W. Chubu Wakasa Bay			
*1687 Oct. 20 06: _		Near Callao			O	Peru	3?	Peru Callao			
Oct. 22 Tokyo 4 IX 17 (Oct. 21) Oct. 22								Chancai Pisco Japan, Sanriku Kamaishi Ryukyu Is. Okinawa			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Houses washed away and many persons drowned. Imamura reported this as a possible storm surge, but the earthquake reported in Fukushima chronicles (Musya, 1941) suggests it may have been a tsunami. Sep. 28 date used by Imamura is correct, Sep. 29 used by Musya is not.</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>Quake accompanied by "sea wave vibration". Musya summary (1951) suggests possible tsunami. More likely sea quake or seiche.</p>	<p>Musya, 1941, 1951</p>	
<p>Musya summary (1951) suggests possible tsunami. Probably confused with 1681 Jun. 12.</p>	<p>Musya, 1951</p>	
<p>No details given. Later authors cite Milne who in turn cites Perrey as source. However no tsunami listed by Mallet and no quake or tsunami listed by Montessus De Ballore both of whom used Perrey's list extensively. Report is at best highly questionable.</p>	<p>Milne, 1912 Heck, 1947 Berninghausen, 1962 Kawasumi, 1963</p>	
<p>No details. No quake reported. Probably a storm surge as Musya suggests.</p>	<p>Musya, 1951</p>	
<p>1st shock at 04.- After major shock at 06: __ sea retreated, then returned with great violence. Town and market destroyed. Observed according to Sieberg.</p>	<p>Anon., 1877 Rudolph, 1887 Milne, 1912 Sieberg, 1932 Musya, 1941 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>12 or 13 waves 0.5 m above ground.</p>		
<p>3 waves in early morning.</p>		

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(1689 _ _ ) (Genroku 2 _ _ )					G			Japan, Sanriku Rikuchu			
(1690 _ _ )		Near Pisco			(O)	Peru		Peru Pisco			
1696 July 25 (Genroku 9 VI 27)					G		2	Japan, Tohoka Fukushima - Onahama			
(Feb. 25) (Feb. 26) ?1696 Nov. 25 (Nov. 26) Genroku 9 XI 1					G			Japan, Sanriku Ishinomaki			
(1697 Feb. 26) Genroku 9 XI 1 ?1698 Dec. 22 Genroku II XI 21		N. E. Kyushu			(G) E	Bungo Strait?		Japan, Sanriku Rikuzen Japan - Kyushu Bungo (Oita Pref.)			
(1699 Mar. ? _ ) (Genroku 12 II _ )		Landslide on Kyushu			V	W. Kyushu		Japan - Kyushu Hizen			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Oral tradition of a small tsunami drowning many people. No quake reported. Imamura considers the tradition really refers to the 1677 Apr. 13 tsunami, which seems likely, or the 1707 Oct. 28 tsunami, which seems unlikely.</p>	<p>Imamura, 1934 Musya, 1941 Imamura, 1949</p>	
<p>In discussion of initial retreat of sea in tsunamis, Milne remarks that in 1690 at Pisco Sea retreated 2 miles, returning in 24 hours. Report probably refers to 1687 Oct. 20 tsunami which Milne (1908) does not otherwise mention.</p>	<p>Milne, 1908</p>	
<p>Many deaths. High wind and no quake. Imamura reports as probable storm surge (Imamura misprints Japanese date as V 27).</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>300 boats washed away. Some deaths. No quake reported. Possibly distant tsunami but considered more likely storm surge. Date misprinted 1646 Feb. 25 (Iida, 1956), Feb. 26 (Musya, 1943), and Nov. 26, and 1697 Feb. 26 (Imamura, 1949) are all results of errors in calendar conversion. Correct date is 1696 Nov. 25.</p>	<p>Musya, 1943 Imamura, 1949 Iida, 1956</p>	
<p>See 1696 Nov. 25</p>	<p>Imamura, 1949 Musya, 1951</p>	
<p>No details. Possibly confused with some other event.</p>		
<p>This tsunami reported by Gondo is undoubtedly the same as that reported by Musya (1943) and Imamura (1949) as occurring one year later (see Genroku 13 II 12 = 1200 Apr. 1) as the result of a landslide in Hizen. Musya (1943) mentions also a Hizen "yama tsunami" (mountain tsunami landslide) in Genroku 12 VI with which the Genroku 13 II landslide was confused in some sources.</p>	<p>Gondo, 1932</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1699 Sep. 8 Genroku 12 VIII 15					F	Enshu Sea		Japan, S. Chubu Suruga Bay and Totomi			
?1700 Jan 27 Genroku 12 XII 8					F*	?		Japan Kii Peninsula Rikuchu-Otsuchi			
*1700 Apr. 1 Genroku 13 II 12		Landslide on Kyushu			V	W. Kyushu	2 1/2	Japan, Kyushu Hizen (now in Nagasaki or Saga)			
*1700 Sep. 12 Genroku 13-Lee-- Shukuso 26 VII__		Korea Heiando (W. Coast)			V	Korea, W. Coast	0?	Korea, W. Coast Uchiura			
(Dec. 30) (XI 22)		34.7N 139.8E	8.2 TAO		G	Sagami-Boso	4	Japan Boso			
*1703 Dec. 31 Genroku 16 XI 23 02: __ 04: __								Katsuura Vic. Tokaido Tokyo Bay	6~9		
								Kamakura Odawara Shimoda Izu Is. Oshima Hachijojima			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Imamura considers a storm surge.</p>	<p>Musya, 1943 Imamura, 1949</p>	
<p>Unusually high tide. Same phenomenon reported in same month but without known date. No quake reported. Distant tsunami?</p>	<p>Musya, 1941 Imamura, 1949</p>	
<p>1000 persons drowned. See also 1699 Mar. _.</p>	<p>Musya, 1943 Imamura, 1949</p>	
<p>No damage.</p>	<p>Musya, 1943 Imamura, 1949</p>	
<p>Genroku Tokaido tsunami. S. part of peninsula depressed. 1020 houses destroyed. About 125 deaths.</p>	<p>Honda, a.o., 1908 Omori, 1913 Gondo, 1932 Imamura, 1937 Musya, 1943</p>	
<p>Minor effects. Report of 6 9m runup by Gondo probably refers properly to Katsunum vic. on Boso penin. 4 waves. Considerable damage. Considerable damage. Houses destroyed. Several deaths.</p>	<p>Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>18 boats and 58 houses lost. 56 deaths. Damage. Sekiya and Omori and Gondo use date one day earlier than other authors.</p>		

[illegible]

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>No details. No quake reported. Storm surge is considered unlikely although many floods occurred about this time. Source of information unknown. Considered to be possibly an erroneously dated reference.</p> <p>30 houses washed away at Miwazaki and Taichiga. No earthquake reported. Distant tsunami?</p> <p>Great Hoei Tokaido-Nankaido tsunami. Enormous destruction. 30,000 lives lost. Observed from Boso to S. E. Kyushu.</p> <p>1168 houses wrecked or washed away. 11 deaths. 1343 houses wrecked or washed away. 13 deaths. Slight.</p> <p>2002 houses wrecked or washed away. 20 deaths. Great damage to fields. 124 ships washed away. 505 houses wrecked or washed away. 32 deaths. Great damage to fields. 4th wave largest. 9 houses wrecked or washed away. 1 death. houses wrecked or washed away. 29,918 deaths. 1000 boats sunk or driven ashore damaging bridges. Great damage to fields. Damage to fields. 3rd wave largest.</p>	<p>Musya, 1943</p> <p>Musya, 1943 Imamura, 1949 Iida, 1956</p> <p>Mallet, 1853 Milne, 1912 Heck, 1947 Berninghausen, 1962</p> <p>Honda, a.o., 1908 Milne, 1912 Omori, 1913 Gondo, 1932 Imamura, 1937 Musya, 1943 Heck, 1944 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1708 Feb. 13</u> Hoei 5 I 22		Ise, Japan			F	Ise	0	Muroto-Yoshiwara Kochi  Suzuki Kyushu Hyuga  Japan Kinki-Ise Chubu-Atsumi Izu Is.-Hachijo			
<u>*1708 Nov. 28</u>					T		2?	Indonesia Amboina			
<u>*1710 Mar. 6</u>		Banda Is.			T	Banda Sea	1?	Indonesia Banda Neira			
<u>*1711 Sept. 5</u>					T		1?	Indonesia Amboina			
<u>*1711 Dec. 20</u> Shotoku 1 XI 11		34.3 N 134 E	6.7 (TAO)		F	Bisan Shyoto	1	Japan, Shikoku Sanuki Heiya			
<u>*1715 Dec. 29</u> Shotoku 5 XII 4		N. E. Kyushu			E	Bungo Strait?	0?	Japan - Kyushu Bepou Bay			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Uplift to 2m.  2286 houses wrecked or washed away. 3 deaths. Depression to 2m. 3rd wave largest.  Imamura reported 28m height.  Inundation to several km.  11 or 12 waves.  420 houses wrecked or washed away. 1 death.</p>		
<p>Water rose to Yamada-Fukiage town.  Musya dates only as Hoei 5 spring. Imamura includes with above.  "Musya dates only as Hoei 5 spring. Imamura includes with above."  "Musya dates only as Hoei 5 spring. Imamura includes with above."</p>	<p>Musya, 1943  Imamura, 1949  Iida, 1956</p>	
<p>Great wave with some damage.</p>	<p>Wichmann, 1918  Heck, 1949</p>	
<p>4 waves.</p>	<p>Sieberg, 1932</p>	
<p>3 moderate waves in bay.</p>	<p>Wichmann, 1918  Heck, 1949</p>	
	<p>Iida, 1956  Kawasumi, 1963</p>	
<p>No details.</p>	<p>Musya, 1951</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(1716) (1716 to 1735) (Kyoho era)					(F?) (G?)			Japan Oshima (?) Rikuzen (?)			
1718 Oct. 5 Kyoho 3 IX 12					F	Ise.		Japan - Kinki Ise and Shima			
(Sept. 14) 1722 Sept. 24 Kyoho 7 VIII 14					F	Ise Bay		Japan, Owari (Ise Bay) Kii			
*1724 Oct. 28)		near Lima			(O)	Lima, Peru		Peru Callao Camana	26		
<u>1725 Mar. 27</u>		Peru				Peru		Peru Camana			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Report by Sapper, copied by Heck, of a tsunami in 1716 may have been based on a Rikuzen record of a tsunami occurring during the Kyoho era (1716-1735), probably the Chile tsunami arriving 1730 July 9. How this could be attributed to Oshima is not known.</p> <p>Musya in his summary table (1951) and Omori reported as a tsunami, and Omori postulated a connection between this tidal wave and a quake inland at Shinano Valley. However, according to Musya's text (1943) this was clearly a storm surge.</p> <p>Disastrous. Water reached Atsuta shrine No quake. Imamura considers possible storm surge. Imamura date of Sep. 14 erroneously converted from old calendar.</p> <p>City flooded, 19 ships sunk; 4 carried inland. Full date s given by Milne 1908. Heck and Berninghausen give only year. No quake or tsunami are listed for this date by Geographical Magazine (Anon, 1877), Montessus de Ballore (1910-13) or Milne 1912. The description of the tsunami effects at Callao is practically identical to that of the tsunami occurring on the same date in 1746, and the report probably represents some confusion of that tsunami with the Camana earthquake of 1725 Mar. 27.</p> <p>Tsunami not listed in Geographical Magazine (Anon, 1877) and not described in Montessus de Ballore detailed discussion (1911a) but merely noted in a list (1912a).</p>	<p>Sapper, 1927 Musya, 1943 Heck, 1947</p> <p>Omori, 1913 Musya, 1943, 1951</p> <p>Gondo, 1932 Musya, 1943 Imamura, 1949</p> <p>Milne, 1908 Heck, 1947 Berninghausen, 1962</p> <p>Horikawa, 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1730 Jul. 8	Jul. 8 09: —	Chile 30 365			Q	Valparaiso	4?	Chile Valparaiso			
Jul. 9 Kyoho 15 V 25								Concepcion (Penco) Valdivia Coquimbo Japan Sanriku, Rikuzen			
1731 Oct. 7 Kyoho 16 IX 7		37.9N 140.6E	6.6 TAO		G			Japan Iwashiro (Iwahi)			
*1732 Feb. 25		Mexico near Acapulco			N	S. Mexico	2	Mexico Acapulco	3		
1732 Kyoho 17, summer		?			F	Unknown		Japan, Izu Is. Hachijo Is.			
(Oct. 6) (X 6) *1737 Oct. 17	(Oct. 16) 16:	SE Kam- chatka			J	SE Kamchatka	5?	Kamchatka Avacha (Avachinskaja Inlet W. of Petropovlovsk)	30		

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Waves affected 1000 km of coast  Tsunami started 1 or 2 hrs. after 1st of 3 violent quakes and reached a maximum 3 or 4 hrs. later, more than 1 hr. after the 2nd quake. Town inundated and part of port destroyed. 3 waves devastating city for 3rd time  Observed according to Sieberg</p> <p>Some damage to rice fields in Ojika peninsula.</p>	<p>Mallet, 1853  Anon, 1877  Montessus de Ballore, 1911, 1912a  Milne, 1912  Sieberg, 1932  Bobillier, 1933  Musya, 1943  Heck, 1947  Imamura, 1949  Iida, 1956  Kawasumi, 1963  Watanabe, 1964</p>	
<p>Inland quake. Tsunami listing by Iida based on description of damage at river mouth by Musya, 1943, <del>but these</del> may been caused by quake. Probably no tsunami.</p>	<p>Musya, 1943  Iida, 1956</p>	
<p>Sea rose to cover plaza. Several waves.</p>	<p>Belcher, 1843  Mallet, 1853  Milne, 1912  Heck, 1947</p>	
<p>No details. Floods occurred at this time. Probably storm surge.</p>	<p>Musya, 1956</p>	
<p>Major quake was third in series. Following it, water came from sea 30m. high. Houses and boats lost. Loss of life. Widely reported but <del>exaggerated</del> height of 60m was based on popular account of Krashinennikov, contradicated by more exact on original account (See Solov'ev and Ferchev).</p>	<p>Gmelin, 1752  Steller, 1781  Mallet, 1853  Mushketov and Orlov, 1893  Milne, 1908  Sapper, 1927</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Oct. 18) (XII 6) (Dec. 17)								Viliuchik R. to Avachinskaie Inlet Nizhne-Kamchatsk Bolsheretsk Kuril Is. Shumshu I.	26		15
								Komandorskie Is. Bering I.	60?		
*1741 Aug. 28 Kampo I VIII 18		Eruption of Matsu- mae Oshima volcano 41.5 N 139.3E			W		3	Japan Oshima I. (W. of Hokkaido)			
Aug. 29 VII 19								Hokkaido Nebuta ~ Kumaishi	9		
								Sado I. Aikawa			
*1742 Nov. —		Kuril Is.			I	N. Kuril Is.	1??	Kuril Is. Paramushir Shumshu			

# TSUNAMI DATA

## Effects and Remarks

A meadow subsided to form a cove.  
No waves reported.  
Waves crossed beach to lagoon.

Quake lasted 15 min. and as it ceased came a wave to 6m, followed by a recession. 2nd wave equally high followed by recession exposing rock in 2nd Kuril Strait. 15 min. later 3rd wave destroyed many houses.

Debris to 60m (?) attributed by Steller in 1740 in tsunami of previous winter. Oct. 6 date (Mallet, Heck, Kawasumi, Sapper, Solov'ev and Ferchev) is Julian calendar equivalent of Oct. 17, Gregorian calendar date (Savarensky, a.o.) (cf Oct. 18 by Sviatlovski). Dec. 6 (Mushketov and Orlov) and Dec. 17 (Savarensky, a.o.) are resp. old and new calendar dates used on an erroneous translation of Gmelin. There was only one 1737 Kamchatka - Kuril tsunami. See Solov'ev and Ferchev.

Oshima volcano first erupted 23 Aug. Tsunami accompanied a second eruption 29 Aug. No quake according to Musya. Kawasumi (1963) quake data may be based on tsunami occurrence. At 20 h~22 h. 1521 boats wrecked at Oshima Is.

"Kaisho" reported by Gondo in early a.m. caused more than 1000 deaths (VII 13 date in Gondo's table pertains to Oshima eruption).

Tsunami reported by Imamura.

No details.

## References

Heck, 1947  
Krashennnikov, 1949  
Sviatlovski, 1957  
Savarensky, a.o., 1958  
Solov'ev and Ferchev, 1961

Gondo, 1932  
Musya, 1943  
Imamura, 1949  
Iida, 1956  
Kawasumi, 1963

Steller, 1781  
Solov'ev and Ferchev, 1961

## Memoranda



[illegible]

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Portion of coast sank producing a bay. City destroyed by 2 waves. All ships in harbor destroyed or beached. One ship stranded about 1.5 km. inland. Of 5000 inhabitants only about 200 survived.</p> <p>Effects similar.</p> <p>Fishing boats washed away. No quake reported. Distant tsunami or storm surge.</p> <p>Old city destroyed for 4th time. Sea withdrew, draining bay. Returned after 7 min. inundating city. Waves continued 24 hrs. City was later rebuilt on present site. Town at Penco is at original site.</p> <p>3 waves flooded city. Ship foundered.</p> <p>Tsunami arrived 14:~16:_. T unusually long. No quake. Flooded houses.</p> <p>See 1751 July 24.</p> <p>Dates of this tsunami are so confusing that many authors have been led to list two tsunamis. The origin date of May 25 adopted here is given in Montessus de Ballore's detailed discussion (1913a) and used by Sieberg, Bobillier, and Berninghausen. It agrees with the date of arrival in Japan reported by Imamura and Musya. The date of May 24 came from a report by Perrey via Milne, and has been used since by Davison (1936), Heck, Iida, and Kawasumi. It may have originated as the Greenwich date or simply because the quake occurred during the night of the 24th. The March date was given perhaps as a misprint or through the use of a Julian calendar date in Montessus de Ballore's provisional lists (1910-16) and was used by Milne and since by Davison (1936), Heck and Iida.</p>	<p>Mallet, 1853 Anon, 1877 Suess, 1904 Milne, 1908 Heck, 1947 Berninghausen, 1962 Kawasumi, 1963</p> <p>Musya, 1943 Imamura, 1949</p> <p>Montessus de Ballore, 1910b, 1911b, 1913a. Milne, 1912 Sieberg, 1932 Bobillier, 1933 Kunitomi, 1935 Anon, 1935 (Miyagi Pref.) Musya, 1943 Heck, 1947 Imamura, 1949 Iida, 1956 Berninghausen, 1962 Kawasumi, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(1751 Jul. 24) Horeki 1 VI* 2		(F)			?	Unknown		Japan, Sanriku Ojika and Kesenuma			
1754 Aug. 18					(T)			Indonesia SE Amboina			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Davison (1936), in his discussion of tsunami history at Concepcion, mentions only one tsunami in 1751 for which he uses the May 24 date. However, in his discussion of the history at Valparaiso he mentions two at Concepcion, adding the Mar. 25 date. Heck listed the same two, perhaps following Davison although not citing him, but instead Bobillier who listed only one tsunami and that not on either of Heck's dates but on May 25. Iida copied Davison or Heck. Besides the Japan arrival date adopted by Imamura and Musya, V 2, Imamura takes note of an alternate IV 26 (= May 21) reported also by Kunitomi and Miyagi Prefecture (Anon 1935). Kunitomi suggested that the Rikuzen tsunami of the latter date was connected with the Takada earthquake of the previous day. However, the Takada shaken was in Niigata Prefecture, on the Japan sea (Kawasumi, 1963). A May 21 arrival in Japan would not fit any of the reported dates of origin in Chile. It is most improbable that the early reports such as those of Ferrey and Montessus de Ballore should each mention but one earthquake and tsunami if there were two such events occurring but a month apart. Hence it is considered here that there was but one Chile tsunami in 1751.</p> <p>No quake reported. Distant tsunami or storm surge. Quite likely a date mistake for V 2 = May 26.</p> <p>Tsunami listed by Heck citing Belcher (1843). Belcher deals solely with the Mexican seismic record. This report probably represents confusion of Belcher's Aug. 17 Acapulco tsunami, Wichmann's Sept. 7 tsunami, and a listing by Mallet (1853) on Aug. 18 of the first quake in the series which terminated Sept. 22.</p>	<p>Imamura, 1949 Musya, 1951</p> <p>Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1754 Aug. 17 (Aug. 20) (Aug. 30) (Sep. 1 )		Mexico near Acapulco			N	S. Mexico	2?	Mexico Acapulco	3		
*1754 Sep. 7		Near Haruku			T	Moluccas	1?	Indonesia Moluccas, Haruku			
*1762 Oct. 31 Horeki 12 IX 15 15: _		38.1 N 138.7 E	6.6 TAO		W	Sado Strait	1	Japan Sado Is.			
1763 Jan. 29 Horeki 12 XII 16 (Sept. 29) 18: _ 20: _		40.8 N 142 E	7.4 TAO		G	Sanriku	1	Japan Sanriku-Hachinohe Hokkaido-Hakodate			
*1763 Mar. 15 Horeki 13 II 1		40.7 N 142 E	7.1 TAO		G	Sanriku	1	Japan, Sanriku Hachinohe			
*1763 Sept. 1		Moluccas			T	Moluccas	0?	Indonesia ?			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Sea covered plaza as in 1732 but with more violence. Aug. 17 date is given Belcher, Aug. 30 by Mallet. Aug. 20 given by Heck is probably misprint. Sept. 1 is given by Milne, by Kawasumi and by Japan Meteorological Agency (Anon, 1960).</p> <p>No details.</p> <p>26 houses washed away.</p> <p>Much damage Sept. date given by Watanabe is erroneous.</p> <p>Many houses washed away. Many deaths.</p> <p>Sudden rise and fall of sea, inundation of land. Milne (1912) who mentions quake only, but not waves, places event in the Moluccas.</p>	<p>Belcher, 1843 Mallet, 1854 Milne, 1912 Heck, 1947 Kawasumi, 1963</p> <p>Wichmann, 1912 Heck, 1947</p> <p>Omori, 1913 Musya, 1943 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Imamura, 1934 Musya, 1943 Imamura, 1949 Iida, 1956 Watanabe, 1964</p> <p>Musya, 1943 Iida, 1956 Kawasumi, 1963</p> <p>Wichmann, 1918 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	Δt	Period
<u>?1765 May -</u>					U	S. China Sea		China Near Canton	9?		
<u>*1768 June 22</u>		New Ire- land			C	St. George Channel		Bismarck Archipelago New Ireland, S. W. part			
<u>*1768 July 22</u> Meiwa 5 VI 9 12: -		26.2 N 127.5 E			V	Near Kerama Is.	1	Ryukyu Is. Kerama Is.			
1769 Aug. 29 Meiwa 6 VII 28 15: -		32.3 N 132 E	7.4 TAO		E	Kyushu	0	Japan, Kyushu Satsuma (S.W. Kagoshima)			
<u>*1771 Apr. 24</u> Meiwa 8 III 10 08: -		24 N 124.3 E	7.4 TAO		E	Ryukyu Is.	4	Ryukyu Is. Yagoyama Group			
								Ishigaki Is.	12		
								Miyako Is.	12		
<u>*1775 Apr. -</u>		Moluccas			T	Moluccas	0?	Indonesia Moluccas - Amboina			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Sea suddenly rose and swept away 10,000 persons. No quake reported. Possibly meteorological in origin.</p> <p>No details.</p> <p>2 or 3 waves. 9 villages damaged. 9 houses destroyed.</p> <p>Although there was a quake in Hyuga (Miyazaki) and Bungo (Oita) there was also a typhoon. Tidal wave at Satsuma was clearly a storm surge.</p> <p>Quake felt throughout islands. Tsunami attacked about 9 h (1 hr. after quake). 3 waves, <u>1st</u> biggest. 11, 941 deaths. 3137 houses destroyed. Height estimates ranged 35 to 380 shaku (12-115 m). Seven villages totally washed away. Height est. 35 shaku. Some damage.</p> <p>Ship in bay driven violently forward and back.</p>	<p>Mallet, 1854</p> <p>Sieberg, 1932</p> <p>Musya, 1943 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Honda, a. o., 1908 Musya, 1943 Heck, 1947 Imamura, 1949</p> <p>Musya, 1943 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Mallet, 1853</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1781 Apr. 11 Tenmei 1 III 18		Eruption and volc. mud flow from Dekijima, Sakuraji- ma vol- cano 31.6 N 131.7 E			E	Kyushu, Sakurajima	1	Japan, Kyushu Kagoshima Bay			
?1782 May 22					V	S. China Sea		Taiwan China Taiwan Strait coast			
*1782 Aug. 22 Tenmei 2 VII 14 (Aug. 23) (VII 15)		35.1 N 139.7 E	7.3		F	Sagami	1	Japan Sagami Odawara Boso Rikuchu			
(VIII 4)								Tokyo			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Tsunami accompanying Dekijima eruption of Sakurajima. 15 casualties. 6 vessels lost or wrecked.</p> <p>Sea rose with great violence and remained high 1 or 8 hrs. (?). Swept away villages and drowned immense numbers. No quake mentioned. Wave possibly of meteorological origin.</p> <p>Disastrous.</p> <p>(?) Aug. 22 date is given by Musya in detailed discussion (1943) and in main summary table. Aug. 23 is given in Musya's brief summary table (1951) and by Kawasumi. Rikuchu occurrence mentioned in Musya summary does not seem substantiated by detailed description.</p> <p>Tsunami at Edo destroying part of Shrine in Fukugawa, reported by Gondo as occurring VIII 4 is very likely the same as the Sagami tsunami of Aug. 22, although it might be the same as that reported by Musya at Edo in 1784. It is possible that the Tennei era tsunami reported in Rikuzen (see 1781-1788) is the same as the Sagami-Boso Tsunami of 1782, and that the doubtful Rikuchu observation is valid. The length of coast along which the effects would then be spread would in that case be greater than seems expectable from the magnitude of the effects at any place. The Sagami epicenter estimated from quake effects would then appear less likely than a Boso epicenter, and the Edo effects could not be explained by this Boso tsunami.</p>	<p>Musya, 1943 Imamura, 1949 Iida, 1956</p> <p>Mallet, 1854</p> <p>Gondo, 1932 Musya, 1943 Iida, 1956 Kawasumi, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1787 Mar. 14 (Mar. 18) (Mar. 28)		Mexico near San Marcos			N	S. Mexico	3?	Mexico Acapulco			
*1788 July 27		Alaska Penin- sula			L	Alaska Peninsula	1?	Alaska Chumagin Is. Unga Sanak Alaska Penin.			
(Apr. 14) IV 4 ?1791 Apr. 15 18: _		Near Nizhne- Kamchatsk			J	E. Kamchatka		Kamchatka Nizhne			
?1791 May 13 Kansei 3 IV 11					E*	Unknown		Ryukyu Is. Naha Osato Tumari and	11 11		
1791 Sept. 13 Kansei 3 VIII 16					F	Osaka Bay	1	Japan - Kinki Sakai (near Osaka)			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Sea withdrew exposing rocks. Galleon reported llm lowering. Other places mentioned by Milne and by Heck are places where the earthquake was felt. Mar. 14 is date given by Belcher. Mallet gives both Mar. 14 and Mar. 18 but points out events on the two dates were probably the same. Mar. 28 is given by Sieberg and by Japan Meteorological Agency (Anon, 1964) and by Milne who also gives Apr. 3 [as end of quake series?].</p> <p>Natives and hogs drowned.</p> <p>Ice in Raduga R. broken up by quake. Tsunami doubtful. Apr. 14 date in translation of Solov'ev and Ferchev is misprint for Apr. 4 Julian equivalent of Apr. 15 Gregorian date. See also 1792 Aug. 23.</p> <p>4 harbors damaged.</p> <p>No quake recorded. Imamura considers distant tsunami.</p> <p>Probably a storm surge as reported by Imamura and Musya.</p>	<p>Belcher, 1843 Mallet, 1855 Milne, 1912 Sieberg, 1923 Heck, 1947 Kawasumi, 1963</p> <p>Grewingk, 1850 Dall, 1870 Holden, 1898 Sapper, 1927 Sieberg, 1932 Heck, 1947 Wood, 1966</p> <p>Pallas, 1793 Sauer, 1802 Sgibnev, 1869 Solov'ev and Ferchev, 1961</p> <p>Musya, 1943 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Imamura, 1949 Musya, 1951</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Feb. 10) (Apr. 1) <u>*1792 May 1</u> Kansei 4 IV 1 May 21		32.8 N 130.3 E	6.4 TAO		V	Ariake Sea	2 1/2	Japan, Kyushu Shimahara  Kumamoto Hisa Tamana Amakusa	9		
<u>*1792 June 13</u> Kansei 4 IV 24		43.6 N 140.3 E	6.9 TAO		W	W. Hokkaido	1	Japan, Hokkaido Shakoton			
<u>?1792 Aug. 23</u> VIII 12		Nizhne Kamchatsk- Petrovav- lovsk			V	S. E. Kamchatka		Kamchatka Nizhne Petrovavlovsk N. Kuril Is.			
<u>*1792 Aug. 29</u> Kansei 4 VII 12		34.5 N 136.7 E			F	Ise Bay	0	Japan, Ise Futami-ga-Ura			
<u>*1793 Feb. 8</u> Kansei 4 XII 28	04:	40.7 N 140 E	6.9 TAO		W	W. Tohoku	1	Japan, Honshu Nishi-tsugaru Ajigasawa			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Unzen Volcano erupted. Slide of volcanic debris on S. slope generated waves in sea of Tsukushi-Ariake; 9745 persons and 496 animals killed.</p> <p>2100 deaths. 4000 deaths. 343 deaths. Omori used unconverted Japanese calendar date, Apr. 1. This was followed in turn by Sapper and by Heck. Honda used date of Feb. 10, which was when earthquake swarm began.</p> <p>Houses swept away. 5 deaths.</p> <p>Raduga R. went dry. Avache Inlet agitated. Tsunami is doubtful. See 1791 Apr. 15 and discussion by Solov'ev and Ferchev.</p> <p>About 5 waves.</p> <p>Sea retreated. Children followed and were drowned. Coastal displacement followed by tsunami.</p>	<p>Honda, 1908 Omori, 1913 Gondo, 1923 Sapper, 1927 Imamura, 1933 Musya, 1943 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Musya, 1945 Imamura, 1947 Iida, 1956 Kawasumi, 1963</p> <p>Mushketov and Orlov, 1843 Sviatlovski, 1957 Savarensky, a. o., 1958 Solov'ev and Ferchev, 1961</p> <p>Imamura, 1949 Musya, 1953 Iida, 1956</p> <p>Imamura, 1931 Musya, 1943 Heck, 1947 Imamura, 1949 Iida, 1956</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1793 Feb. 17</u> Kansei 5 I 7  (1789~1800) (Kansei era)	01:	38.3 N 142.4 E	7.1 TAO		G	Sanriku	2	Japan, Sanriku Rikuchu Otsuchi  Ryoishi Ofunato and Kamaishi Rikuzen Kesenuma  Okachi	0.6		
<u>*1799 June 29</u> Kansei 11 V 26		36.6 N 136.6 W	6.4 TAO		W	W. Chubu	1	Japan - W. Chubu Ishikawa (near Kanazawa)			
<u>?1799 --</u>		Sumatra			W?	Sunda Str. or Java Sea?		Indonesia Sumatra	15		
<u>*1802 Aug.</u>		Amboina			T	Banda Sea	1?	Indonesia Amboina			
<u>?1802 Dec. 9</u> (Dec. 28) Kyowa 2 XI 15 10:_		37.8 N 138.4 E	6.6 TAO		W	N. Chubu		Japan, N. W. Honshu Niigata			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Quake followed by tsunami dashing over Sango Islet at mouth of Bay. Flooded town as in 1856. 100 houses washed away, 720 deaths. 17 houses swept away. 12 or 13 drowned.</p> <p>Report by Musya of tsunami reaching 2 shaku (ft.) above floor during this era probably refers to this tsunami.</p> <p>Many deaths.</p> <p>No details. Probably W. coast, because all other Sumatra tsunamis have been on W. coast, and hence Indian Ocean and not Sunda Strait.</p> <p>Sea very high after quake. Data is before Aug. 25.</p> <p>Land rose, and Niigata history reports tsunami, but Imamura considers report based solely on relative retreat of sea due to land emergence. Milne erroneously reports tsunami Dec. 28</p>	<p>Imamura, 1934 Musya, 1943 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p> <p>Honda, a. o., 1908 Omori, 1913 Musya, 1943 Heck, 1947</p> <p>Wickmann, 1918 Heck, 1947</p> <p>Mallet, 1855 Wichmann, 1918 Heck, 1947</p> <p>Milne, 1912 Imamura, 1933 Heck, 1947</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1804 July 10 Bunka 1 IV 4		39 N 140 E	7.1 TAO		W	W. Tohoku	1	Japan, W. Tohoku Dewa (Akita and Yamagata) Kisagata			
*1808 Aug. 8 Bunka 5 VI * 17 (5 X* 17)		Awa, Shikoku			F	Kii Suido	1/2	Japan Shikoku Awa (Tokushima) Naka (E. Coast)	1.5		
?1808 Dec. 4 Bunka 5 X 17					F			Japan - Kinki Kii - Kumano			
?1810 Sept. 25 Bunka 7 VIII 27 15:_		39.9 N 139.9 E	6.6 TAO		W	W. Tohoku	0	Japan, W. Tohoku Oga Peninsula			
(1812 _ _ )		San Francisco			M	California, near San Francisco		California San Francisco			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Land upheaved N. and S. of Chokaisan. Lake dried up. Many drowned by tsunami.</p>	<p>Honda, a.o., 1908 Omori, 1913 Musya, 1943 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>Musya, in detailed description (1943), cited an alternate reported date of the 17th of an extra Xth month, but pointed out that in 1808 the extra month was the Vith.</p>	<p>Musya, 1943 Musya, 1951 Imamura, 1949 Iida, 1956</p>	
<p>No details. Event is not reported in Musya's detailed descriptions (1943). Report may have arisen through confusion with the X* 17 alternate for the tsunami of Aug. 8 in Awa.</p>	<p>Musya, 1951</p>	
<p>Tsunami described. Musya was skeptical on the inadequate basis that it could not be seen from a mountain top.</p>	<p>Musya, 1943 Iida, 1956</p>	
<p>Report based on informal communication, at least 2nd hand, that "in 1812 the earthquakes were so severe as to cause tidal waves which covered the ground where the plaza now is." Holden placed this at San Francisco. It seems unlikely that an event as unusual as this should have escaped more formal contemporaneous recording, and not unlikely that the report actually refers to the Dec. 21 events at Santa Barbara although Wood uses the report as evidence that the quake was associated with motion on a fault crossing San Francisco Bay rather than a more seaward fault.</p>	<p>Holden, 1898 H. Wood, 1916</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1812 Dec. 21		Santa Barbara			M	California, near Santa Barbara		California Santa Barbara ? Refugio	3??		
71813 -- or 1814 --					R*	Unknown		Hawaiian Is. Hawaii - Hookena			
*1814 --		Kisser Is. near Timor			T	Banda Sea	1?	Indonesia Timor			
(Apr. 4) 1815 Apr. 10 Apr. 11?		Sumbawa with Eruption of Tam- bora Vol- cano			T	Flores Sea ?	2?	Indonesia Sumbawa - Bima Amboina	3.6		

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>A ship affected.  Holden quotes an informal report first published by Bancroft "...that there was a huge earthquake wave at sea...A ship at Refugio was carried up a canon by the wave and returned to sea." Another reference to what is probably the same incident, although attributed variously to Sept., Oct., or Dec., is quoted by Holden from Trask: "A Spanish ship at anchor, 38 miles from Santa Barbara, was injured by the shock." If the San Francisco report (See 1812 __) is assumed valid except that the location was really Santa Barbara or some nearby mission town, and if the Bancroft account of the ship is assumed correct, there must have been a tsunami of considerable magnitude (3t?). If, however, the San Francisco report does not apply to events on this date, or if it refers to ground-water effects such as are sometimes confused with oceanic effects of quakes, and if the Trask account of the ship is correct and indicates only a sea quake, then there may have been no tsunami at all.</p> <p>Tsunami observed along Kona coast. No details.</p> <p>No details.</p> <p>Heck, following Wichmann, gives Apr. 10 for date of quake and waves. Sieberg gives Apr. 10 for date of great earthquake, only, at Sumbawa, which he associates with eruption of volcano Tambora. On Apr. 11, however, he mentions a wave at Amboina and a quake felt there and in SE Borneo. These are here considered probably different manifestations of the same event. Sapper associates the wave and quake with the Tambora eruption but gives the date as Apr. 4.</p>	<p>Bancroft, _____  Holden, 1898  Wood, H., 1916  Heck, 1949</p> <p>Ii, 1959</p> <p>Sieberg, 1932</p> <p>Wichmann, 1918  Sapper, 1927  Sieberg, 1932  Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1815 Nov.		Bali N. Coast			T	Flores Sea	1?	Indonesia Bali			
1816 Dec.? _ Bunka 13 XI 2					F			Japan - Chubu Izu - Matsuzakigama			
*1819 _ _ _		Emotion of Asuncion			S	Marianas	1?	Marianas Is. Asuncion			
*1819 Apr. 11 23: _  Apr. 12 (May _ )		Chile, Atacama			P	Atacama	2?	Chile Caldera Constitucion Hawaiian Is. Hawaii W. Coast	2.0	3.0	T=11 min.
(May 2) (May 4) *1820 May 10		Mexico near Acapulco			N	S. Mexico	2?	Mexico Acapulco	3 4		

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Inundation. Exact date is given only by Sieberg, who reports "agitation of the sea."</p>	<p>Wichmann, 1918 Sieberg, 1932 Heck, 1947</p>	
<p>"Kaisho" of time of heavy rains. Possibly a storm surge or possibly only a river flood.</p>	<p>Gondo, 1932</p>	
<p>No details.</p>	<p>Sapper, 1927 Heck, 1947</p>	
<p>Sea receded and returned inundating 300 m. City damaged. Vessel La Fortuna at anchor near dock wrecked on rocks. 13 oscillations, fall as great as 2 m. Hawaiian observations erroneously dated May by Jarvis (1843, 1872) and Jaggar (1931, 1946), Alexander (1891) and Brigham (1866).</p>	<p>Arana, Barres, — Brigham, 1866 Anon., 1896 Montessus de Ballore, 1911a Milne, 1912 Willis, 1929 Jaggar, 1931, 1946 Bobillier, 1933 Heck, 1947 Macdonald, a. o., 1947 Shepard, a. o., 1950 Berninghausen, 1962</p>	
<p>Sea retired farther than in 1787, oscillated, and returned in 2 hrs. covering plaza and rising to door of church on high side of town. May 2 is date given by Belcher. Mallet gives May 4 as date of start of series of violent quakes and May 10 as date of tsunami. Heck copied both May 4 and May 10.</p>	<p>Belcher, 1843 Mallet, 1855 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1820 Dec. 29		Near Sumbawa?			T	Flores Sea	4?	Indonesia Sumbawa Bima Celebes Macassar Nipa-Nipa Serang-Serang	18-24?		
(1821 _ _ )					T	Flores Sea?		Indonesia Sumbawa Bima Macassar Celebes			
*1822 Nov. 19 10:15 _	Nov. 20 03:01	Near Valparai- so			P	Near Valparaiso	2?	Chile Copiapo to Valdivia Valparaiso  Peru Callao			
(1827 _ _ )		Unimak volcanic eruption			(K)	Aleutian Is. near Unimak		Alaska Shumagin Is. Chernabura Is.			

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

See 1821.

Wall of water swept over port at Boelekomba. 400-500 deaths.  
Great damage.  
Great damage.

Great wave carrying ships over houses. Heck (1947) points out Wichmann listed only one Macassar wave, that on 1820 Dec. 29, and considers the Mallet account refers to the earlier date.

Great Valparaiso earthquake and tsunami. Coast raised 1-2 m for about 150 km. Sea rose to greater heights than in any preceding tsunami, then receded leaving small boats stranded. Continued to rise and fall for 1/4 hour, diminishing. Earthquake effects reported felt by ships. Milne gives the Greenwich date of Nov. 20 and an additional date of Nov. 25 without explanation. Mallet indicates this is date of one of aftershocks. The evidence for coastal uplift was a matter of controversy for many years (Suess, 1904) but now seems well founded.

Report by Heck citing Dall of tsunami accompanying eruption of volcano on Unimak I. However, Holden, Heck and Eppley, and Wood report in 1827 only an undated quake in the Kommandorski Is., evidently that reported by Russian authors (see 1827 Jun.-Jul). Confusion with Aug. 9-10 tsunami accompanying Avacha eruption seems very likely.

Mallet, 1855  
Wichmann, 1918  
Sieberg, 1932  
Heck, 1947

Mallet, 1855

Graham, 1824  
Cuming, 1840  
Mallet, 1855  
Suess, 1904  
Montessus de Ballore, 1910-1911b  
Milne, 1912  
Davison, 1936  
Heck, 1947  
Berninghausen, 1962  
Kawasumi, 1963

Holden, 1898  
Heck, 1947  
Heck and Eppley, 1958  
F. Wood, 1966



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(1827 June _ ) or July _ ) (VI _ )		Komandor- ski Is.			J	Komandorski Is.	1?	Komandorski Is. Bering and Medny			
*1827 Aug. 9 VII 27 or Aug. 10 VII 28	Aug. 9 04:_ Aug. 9 21:_	Near Ava- cha volcano & assoc. with eruption			J	Near Petropavlovsk	1?	Kamchatka Avacha Bay Komandorski Is. Bering and Medny Alaska Chernabura Is.			
?1828 Mar. 30		Near Lima			O	N. Peru		Peru Coastal cities north of Lima			
?1828 May 26 Bunsei 11 IV 13 (Dec. 18)		37.6 138.9	6.9 TAO		W	Chijiwa Bay or Amakusa Sea ?		Japan - Kyushu Nagasaki ~ Amakusa			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Water level change - greater than 3m/min. Reported by Mushketov and Orlov in June, Julian. As shown by Solov'ev and Ferchev, the report was based on errors arriving through repeated translation and interpretation of report by Lutke of quake (see above). Lutke remarked only that such quakes were sometimes accompanied by water level changes of about 3 m. Solov'ev and Ferchev have suggested also that the tsunami report may have arisen through Komandorski observation of 9-10 Aug. Avacha tsunami and confusion of date with Jun. quake.</p>	<p>Lutke, 1835 Postels, 1836 Mushketov and Orlov, 1893 Solov'ev and Ferchev, 1961</p>	
<p>Sea ran far out at time of one of earthquakes on Jul . 27 or 28 (old calendar).</p> <p>(See 1827 Jun. or Jul.)</p> <p>? (See 1827 — —).</p>	<p>Mertons, 1829 Kittlitz, 1858 Postels, 1836 Ulanuu, 1931 Savarensky, a.o., 1958 Solov'ev and Ferchev, 1961</p>	
<p>Destructive. Report by Sieberg not confirmed by other authors. Description by Mallet (1854) makes it quite clear that at Callao, at any rate, the only marine effect was a sea quake.</p>	<p>Sieberg, 1932</p>	
<p>Earthquake said to have been accompanied by submarine disturbance and waves. This event and an undated flood are the only ones found in Japanese records that might have been the basis for Milne's report of sea waves accompanying the Echigo (Niigata) quake of Dec. 18. Heck erroneously listed the Echigo site of the quake as the site of the reported tsunami.</p>	<p>Milne, 1912 Musya, 1943 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1828 Nov. 9 18:30		Near Manila			U	Manila Bay ?		Philippine Is. Luzon - Manila			
*1828 Dec. 29		Near Macassar?			T	Flores Sea	1?	Indonesia, Celebes Macassar, Boelekomba			
1830 Jan. 18 17:15		Near Manila			U	Manila Bay ?		Philippine Is. Luzon, Manila			
*1833 Mar. 10 22:00		Near Acapulco			N	Near Acapulco	1?	Mexico Acapulco	12		
*1833 Dec. 7 Tenpo 4 X 26 (Dec. 12) 16: _		38.7 N 139.2 E	7.4 TAO		W	W. Tohoku - N. Chubu	2 1/2	Japan Sado Is. to S. tip of Hokkaido Chubu Sado Is. Echigo (Niigata) Tohoku Dewa and Shonai (Sakata area) Hokkaido Fukuyama			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>After quake river rose to flood height and overflowed. Next day it fell below usual level. Probably hydrolic effects other than a tsunami.</p>	<p>Saderra, 1895 Repetti, 1946</p>	
<p>Sea rose to great height and fell several times.</p>	<p>Mallet, 1854 Milne, 1912 Wichmann, 1918 Heck, 1947</p>	
<p>Saderra quotes Perrey to the effect that the water in the river rose. Perhaps same event as that reported in 1828 Nov. 9, and in any case probably not a tsunami.</p>	<p>Saderra, 1895</p>	
<p>Strong quake followed by 12 m lowering of sea and then gentle resurrection of original level.</p>	<p>Belcher, 1843 Heck, 1947</p>	
<p>597 houses washed away. 48 lives lost.</p> <p>Sea withdrew, then returned.</p>	<p>Honda, a. o., 1908 Milne, 1912 Omori, 1913 Musya, 1943 Heck, 1947 Imamura, 1949 Iida, 1956 Kawasumi, 1963</p>	
<p>6 villages destroyed. 15 drowned.</p> <p>Date of Dec. 12 was given by Honda, a. o.</p>		

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1834 Feb. 9 Tenpo 5 I 1 > 10: _		43.3 N 141.4 E	6.4 TAO		W	W. Hokkaido	1	Japan, Hokkaido Ishihari			
*1834 Mar. 13					N	Near Acapulco	1?	Mexico Acapulco			
(1835 _ _ )					(H)			Japan, Hokkaido Hanasaki (Nemuro Hento)			
*1835 Feb. 20 11:30 ~ 11:40	Feb. 20 16:26	Chile 26-38 S			Q	Chile	3?	Chile Santa Maria Is. Talcahuano	7.5	0.3	
								Constitucion Copiapo ~ Chiloe Juan Fernandez Is.	4.5		
								Hawaiian Is.			
*1835 July 20 (Tenpo 5 VI 25) Tenpo 6 VI 25 (Aug. 19) 14: _		37.9 N 141.9 E	7.6 TAO		G	Sanriku	2	Japan, Rikuzen Sendai area			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>2 or 3 waves. About 50 houses washed away.</p> <p>Sea receded 33 m. and returned destroying several buildings.</p> <p>Tsunami reported by Honda. Probably misprint for Hanabuchi (Sendai area) and identical to 1835 July 20.</p> <p>Great Concepcion earthquake and tsunami. Uplifted 2.7 m. 3 waves increasing in height, then lesser waves for 3 days. 80-ton schooner lifted from stocks and carried 300 m. inland.</p> <p>Ships sunk in port. Waves reported over distance of 1600 km. 4 waves (Sapper attributed to a volcanic eruption in Juan Fernandez Is.). As in case of 1822 Nov. 19 quake, evidences of uplift were debated at length. It was agreed that after 1835 quake the uplift gradually decreased. Tsunami swept over Kauai; moderate damage.</p> <p>Several hundred houses washed away. Many deaths. Imamura misprints Japanese year as Tenpo 5. Sieberg gives date of Aug. 19 for a quake at Mutsu (Aomori) and Hokkaido accompanied by a tsunami at Sendai, confusing report given here under 1835 Sept.--with report of Sendai event.</p>	<p>Honda, a. o., 1908 Musya, 1943 Heck, 1947 Iida, 1956</p> <p>Belcher, 1843 Mallet, 1855 Heck, 1947</p> <p>Honda, a. o., 1808</p> <p>Fitzrog, 1839 Darwin, 1840 Mallet, 1855 Anon., 1877 Montessus de Ballore, 1907, 1913a Milne, 1908, 1912 Sapper, 1927 Bobillier, 1933 Davison, 1936 Heck, 1947 Shepard, a. o., 1950 Berninghausen, 1962 Kawasumi, 1963</p> <p>Gondo, 1932 Imamura, 1934 Musya, 1943 Imamura, 1949 Iida, 1956 Kawasumi, 1963 Watanabe, 1964</p>	

See also 1835 Sept.--and Sept. 5

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Aug. 19) ?1835 Sept. Tenpo 6 VIII _					H* ?	Uncertain		Japan - Hokkaido Nemuro-Hanasaki			
*1836 July 3 (June 3)	July 3 13:06				P	N. Chile	1?	Chile Antofagasta ? Cobiya ?			
(Tenpo 7 VI 25) ?1836 Sept. 5 Tenpo 7 VII 25 (Ninko Tenpo 6 _)		37.7 N 142 E	5.9 ? TAO		G	Sanriku	1	Japan Rikuzen-Sendai			

## TSUNAMI DATA

## Effects and Remarks

More than 50 houses destroyed. Account of tsunami is given in report of Nemuro observatory quoted both by Sekiya and Omori and by Musya in their descriptions of Tenpo 7 VII (=1836 Sept. 5) Rikuzen quake, with interpretation that VIII of original report should actually be VII and neglect of fact that year of original report is different also. The Nemuro report is probably the basis for Honda's listing of a tsunami at Hanasaki in 1835 (no date) and Milne's listing of a quake and tsunami at Nemuro on 1835 Aug. 19. (See also July 20 and 1836 Sept. 5).

No details. Date is given as June 3 in a 1912 (a) listing by Montessus de Ballore in his "History" but as July 3 in his preliminary lists (1910-118) and in his detailed discussion (1911a) in the "History".

Listing of tsunami on Tenpo 7 VII 25 in Musya's summary (1951) is based on description of effects at Sendai in a letter quoted in his 1943 detailed report, which might equally well refer to the event of 1835 July 20 rather than this quake 13 months later. Miyagi Prefecture in 1935 (Anon 1935) listed a tsunami on Tenpo 7 VI 25 with a description identical to that here given as Tenpo 6 VI 25=1835 July 20. Kunitomi (1933) in a report reprinted in the same Miyagi Prefecture report, and Miyagi Prefecture in an earlier report (Anon 1903) listed a tsunami on the 6th year of Ninko's reign, which would be Buorei 5=1822, but again the description is essentially the same and Kunitomi equates it with that reported as Tenpo 7 VII 25 and here considered Tenpo 6 VI 25=1835 July 20. It seems doubtful that there was a Sendai tsunami in 1836.

## References

Sekiya and Omori, 1904  
Honda, 1908  
Milne, 1912  
Musya, 1943

Montessus de Ballore, 1911-1912a  
Milne, 1912  
Heck, 1947  
Berninghausen, 1962

Musya, 1943, 1951  
Iida, 1956

## Memoranda



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1837 Nov. 7	Nov. 7 12:51	S. Chile			Q	S. Chile	3?	Chile Valdivia			
								Samoa Tutuila			
								Hawaiian Is. Hawaii			
								Hilo	6.0	16.5	
								Kan			
								Maui			
								Lahaina	2.5		
								Kahalui			
								Oahu			
								Honolulu	2.4	15.5	28
								Japan, Rikuzen Motoyoshi			
								Kesen, Miyagi and Ojiku Coast			
1839 May 1 Tempo 10 III 18		Kushira and Tsugaru	7.3 TAO		H			Japan			
*1840 Jan. 16 Jan. 18		Calif., near Santa Cruz			M	Near Santa Cruz	1?	California Santa Cruz			
*1840 Mar. 22		S. E. Luzon			U	Sorsogon Bay	1?	Philippine Is. Luzon, Sorsogon			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>According to Montessus de Ballore (1912a) there were no reports of wave observations in South America. Destruction in Valdivia was by quake not tsunami.</p> <p>Sea withdrew, then returned. 66 houses destroyed, 14 dead. 108 houses destroyed, 46 dead.</p> <p>Bay bottom bared 36 m. before wave. 2 deaths.</p> <p>Sea level drop of 2.4 m. Rise in 28 m. to ordinary tide height.</p> <p>Tsunami observed without quake is considered Chile tsunami although date as given by Musya is a month too late.</p> <p>Tsunami reported in Musya's summary is probably a mistake. Tsugaru may have been mistaken for tsunami.</p> <p>No detail.</p> <p>N. coast of Sorsogon Bay sank 1.5 m. 35 drowned. Event not listed by Saderra 1895 nor by Repetti 1946.</p>	<p>Rooke, 1838  Jarves, 1843  Bingham, 1847  Wilkes, 1850  Mallet, 1854  Brigham, 1866  Bennet, 1869  Coan, 1882  Cumming, 1883  Alexander, 1891  Anonymous, 1896  Hitchcock, 1911  Milne, 1912  Jaggard, 1931, 1946  Musya, 1943  Heck, 1947  Shepard, a. o., 1950  Gutenberg and Richter, 1954  Berninghausen, 1962  Watanabe, 1964</p> <p>Musya, 1951</p> <p>Holden, 1898  H. Wood, 1916  Bancroft,</p> <p>Sieberg, 1932</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1841 May 18 V 6 08: _ May 17	(May 17) 21:25	Kamchatka near Petropav- lovsk			J	Near Petropav- lovsk	2?	Kamchatka Petropavlovsk Cape Shipnusi Hawaiian Is. Hawaii Hilo Maui Lahaina Oahu Honolulu	1±    4.6 1.0 1.0	6.4±	25   40
*1841 Nov. 26		Banda Sea near Moluccas			T	Banda Is.	1 1/2?	Indonesia, Moluccas Banda Neira	2.4 to 2.7		
*1841 Dec. 16		Banda Sea near Moluccas			T	Banda Sea near Moluccas	1?	Indonesia Moluccas Amboina Buru Ambelau	1.2-1.5		
1843 IV 13 *1843 Apr. 25 Tempo 14 III 26 06: _		141.8 N 144.8 E	8.4 TAO		H	E. Hokkaido - S. Kuril Is.	2.2	Kuril Is. Urup  Japan Hokkaido Nemuro Notsuke Kushiro Akkeshi Bay  Oshima Honshu Sanriku	      4.5  4±		24

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Destructive tsunami. Water fell 1 m. Ship broke loose. Hut and yurts washed away.</p> <p>Sudden water level changes on the order of 1 m.</p> <p>Sudden drop at 17:30 leaving reef bare. Two other oscillations.</p> <p>Tsunami struck south coast.</p> <p>Houses wrecked and lives lost.</p> <p>Water began swift flow out of Aleutka Bay 3 min. after quake, then bay filled and inundated shore. Repeated several days.</p> <p>Great damage by tsunami after quake. Many houses completely washed away and 45 deaths at Shinryu village.</p>	<p>Jarves, 1843, 1872  Brigham, 1866  Bennett, 1869  Cumming, 1883  Alexander, 1891  Jaggar, 1931  Macdonald, a. o., 1947  Shepard, a. o., 1950  Sviatlovsky, 1957  Saravensky, a. o., 1958  Solov'ev and Ferchev, 1961</p> <p>Wichmann, 1918  Heck, 1947</p> <p>Wichmann, 1918  Heck, 1947</p> <p>Doroshin, 1870  Honda, a. o., 1908  Milne, 1912  Omori, 1913  Imamura, 1934, 1949  Musya, 1943  Iida, 1956  Savarensky, a. o., 1958  Solov'ev and Ferchev, 1961  Kawasumi, 1963  Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1845 Feb. 8		Celebes			T	Celebes	0?	Indonesia, Celebes Manado			
?1845 Sept. ? Koka 2 VIII 1-10					W	W. Kyushu		Japan, Kyushu Nagasaki			
*1846 Jan. 25 09: _		Ternate I .			T	Moluccas	0?	Indonesia, Moluccas Ternate I .	(1.2)		
*1846 Mar. _ Koka 3 II _					G	Sanriku	1	Japan, Sanriku Rikuchu, Kuwagasaki	2		
?(1847 May 24) 03: _		12 S 78 W (Sea quake)			(O)	Peru		Peru Callao			
1847 Aug. 27 Koka 4 VII 17					G	Sanriku	1	Japan, Sanriku Rikuzen Kesen, Motoyoshi, Ojika, Momco, and Miyagi			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Sea withdrew to outer end of mole and returned.</p> <p>In Edo they say that a tsunami attacked Nagasaki. Musya considers the report unreliable. Possibly a storm surge.</p> <p>(Sea rose 1.2m and sank as much. Oscillation continued to 16:)</p> <p>About 200m inundation.</p> <p>Unusual motion of water in harbor. Report by Rudolph not supported by the British Association report he cites not by any other author.</p> <p>75 ships washed away. 335 deaths.</p> <p>No quake. Imamura considers probably a storm surge.</p>	<p>Wichmann, 1918 Heck, 1947</p> <p>Musya, 1943</p> <p>Rudolph, 1898 Milne, 1912 Wichmann, 1918 Heck, 1947</p> <p>Musya, 1943 Imamura, 1949 Iida, 1956</p> <p>Rudolph, 1887</p> <p>Musya, 1943 Imamura, 1949</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1848 June? -</u> <u>1848 VI -</u>		Near Petropav- lovsk			J	S. E. Kamchatka		Kamchatka Petropavlovsk			
(Oct. 16) <u>1848 Oct. 17</u>		?			A	Cook Strait	1?	New Zealand Wellington Nelson Wanganui			
<u>*1849 Jan. 24</u>		Guam			S	Guam	1?	Marianas Is. Guam, Umatac			
<u>*1849 Sept. 29</u> <u>or Oct. 29</u> <u>1849 IX 16</u> <u>or X 16</u>	09:00	Komandorsk Is.			J	Komandorsk Is.	1?	Komandorsk Is. Bering and Mednyi Is.			
(June 17) <u>1849 Dec. 17</u>		Coquimbo- Valparaiso			P	N. Chile	2?	Chile Coquimbo and La Serena		0.2	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>After quake, sea said to have risen on shore and then receded leaving Avacha Bay dry, according to incidental note by Doroshin. Solov'ev and Ferchev consider this very possibly applicable to the 1841 May 17.</p> <p>No details.</p> <p>Milne gives range of possible dates Oct. 16-25 with preferred date Oct. 17. Heck uses Oct. 16.</p> <p>No details. (Kawasumi (1963) reports quake , only, on Jan. 25).</p> <p>Quaking lasted from 8 p.m. to next morning. Sea alternately ebbed and flowed, destroying buildings. Doroshin gives the Sept. date , Perry the Oct. date .</p> <p>Considerable damage. Milne listed an additional tsunami on Jun. 17 at La Serena, which he omitted from places affected on Dec. 17, citing Montessus de Ballore, 1911b. However, in Montessus de Ballore's other lists and detailed discussion 1911a, La Serena is listed as one of the places affected by the Dec. 17 tsunami, no quake or tsunami is reported at La Serena on Jun. 17, and in fact there is no mention of a tsunami occurring anywhere in several months preceding Dec. 1849. It is assumed that Milne's extra tsunami, which was listed also by Heck and Berninghausen, did not exist.</p>	<p>Doroshin, 1870 Solov'ev and Ferchev, 1961</p> <p>Milne, 1912 Heck, 1947</p> <p>Sieberg, 1932</p> <p>Perrey, 1869 Doroshin, 1870 Soloviev &amp; Ferchev, 1961</p> <p>Montessus de Ballore, 1907, 1911a Milne, 1912 Willis, 1929 Heck, 1947 Berninghausen, 1963</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1850 July 20 Kaei 3 VI 12					(G)	Unknown		Japan Rikuchu			
?1851 Apr. 2 03:41 (Apr. 13)		Near Santiago			Q	Chile		Chile Santiago			
*1851 May 26	18:14	Atacama			P		1?	Chile La Serena and Coquimbo Caldera and Huasco	1.5		
1851 Nov. 13 19:00		San Francisco			M	San Francisco Bay?		California San Francisco			
1852 Nov. 26 07:40					T	Banda Sea	2?	Indonesia Amboina Banda Neira Caroline Is.	8 (?) 2		
*1853 Nov. ? - XI -		S. Kuril Is.			I	S. Kuril Is.	2?	Kuril Is. Simushir			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Reports of great sounds and tsunami. Musya regards as very doubtful.</p> <p>Rudolph, who uses Apr. 13 date, says "water spilled from harbor." Milne (1908) who uses Apr. 2 date, says there was no flood, and Montessus de Ballore (1912-13a) who also uses Apr. 2, says the quake was felt by ships in the harbor but mentions no waves.</p> <p>Tsunami strongest. Tsunami weaker. Places are given by Sieberg; Montessus de Ballore discussed effects at Caldera and Huasco; only Milne and Heck listed several inland places. Berninghausen (1964) did not discuss this tsunami.</p> <p>"Motion of the waters of the bay." Perhaps a seiche. Probably not a tsunami.</p> <p>Height may refer to range.</p> <p>?</p> <p>Waves penetrated far inland.</p>	<p>Musya, 1951</p> <p>Rudolph, 1887 Montessus de Ballore, 1912, 1913a</p> <p>Montessus de Ballore, 1911a Milne, 1912 Sieberg, 1932 Heck, 1947</p> <p>Holden, 1898 Perrey</p> <p>Rudolph, 1887 Milne, 1912 Wichmann, 1918 Heck, 1947 Kawasumi, 1963</p> <p>Ditmar, 1901 Solov'ev and Ferchev, 1961</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1854 May 31</u> 04:50		Santa Barbara			M	California, near Santa Barbara ?		California Santa Barbara			
<u>*1854 July 9</u> VI 27		Kuril Is. near Shumshu			I	N. Kuril Is.	2?	Kuril Is. Shumshu			
<u>1854 Oct. 26</u>		San Francisco and Benicia			M	California, near San Francisco ?	1?	California San Francisco ? Benicia ?			
<u>?1854 Nov. 1?</u>					M*	Unknown		California Angel Is.	1+?		
<u>?1854 Dec. 4</u>					N ?	Mexico ?		Mexico Acapulco			

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

Sea waves following shock or shocks.

Townley and Allen, 1939

Waves flooded almost half of low island.

Ditmar, 1901  
Solov'ev and Ferchev, 1961

Sea wave following shock or shocks.

Trask, 1864  
Holden, 1898  
Perrey

From calm sea with no wind: "water rose several feet with high waves, lasting half an hour." Possibly a distant tsunami.

Holden, 1898  
Wood, H., 1916

"When Acapulco was destroyed the sea . . . returned as gently as it went out." Unclear whether destruction by quake or wave. Neither quake nor tsunami mentioned this date by Milne's catalog (1912) although an Acapulco quake is mentioned under 1854 May. 5. If there was a tsunami this date, which is uncertain, it may possibly have been a distant one.

Milne, 1908



TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Great Ansei Tokkaido Tsunami. Effects observed from E. Honshu to SE Kyushu.</p> <p>816 houses wrecked, 85 deaths. 3rd largest wave. 13 ships driven ashore. Russian man-of-war wrecked. All houses wrecked. 35 boats wrecked. Slight effects.</p> <p>881 houses wrecked, 14 deaths. 124 boats wrecked. 159 houses wrecked, 4 deaths. 2nd largest wave. Several ships wrecked.</p> <p>34 houses wrecked, 2 deaths. 4th largest wave. 90 boats wrecked.</p> <p>145 houses, 11 deaths. 3rd wave was above. Inundated to 200 m, total destruction.</p> <p>90 deaths. 2nd largest wave. Great losses.</p> <p>3 waves before 14:__. Minor effects. No details. Observed. No details.</p>	<p>Bache, 1856  Montessus de Ballore, 1907  Milne, 1908  Honda, a.o., 1908  Milne, 1912  Omori, 1913  Wilson, 1928a  Gondo, 1932  Imamura, 1937  Heck, 1947  Imamura, 1949  Musya, 1951  Iida, 1956  Kawasumi, 1963</p>	
<p>Great Ansei Nankaido Tsunami. Effects observed from N. E. Kyushu to Izu. 15,000 houses washed away. 3,000 deaths mostly from drowning.</p> <p>Inundated again. Moderate effects. Bores developed at several places. Great damage. 8,496 houses wrecked or washed away.</p> <p>Bore wrecked 771 larger and 75 smaller vessels. 25 bridges destroyed. 400 drowned. Damage less severe than in 1707.</p>	<p>Bache, 1856  Honda, a. o., 1908  Milne, 1912  Omori, 1913  Wilson, 1928a  Gondo, 1932  Imamura, 1937, 1949  Musya, 1951  Iida, 1956</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Dec. 24								Shikoku Tosa  Kyushu Hawaiian Is. California San Francisco San Diego	0.3 0.3	1±   12±	
*1855 Jan. 23? Feb. 14?		Near Wellington ?			H	Near Wellington	2?	New Zealand			
*1855 July 10 or July 11		Near Los Angeles			M		0?	California Point San Juan (San Juan Capistrano)			

# TSUNAMI DATA

## Effects and Remarks

Great damage. 1,500 bldgs. wrecked or washed away. 175 ships wrecked. Many deaths.

Observed. No details.

Effects in California of this tsunami as well as that of previous day were noted by Bache although he was unaware that there had been more than one quake. A failure to discriminate between the effects of the two quakes with their respective tsunami has been common. Gondo, for example, used the XI 4 date for the damage at Osaka from the second tsunami although using the correct XI 5 date for the effects at Awa. Even Milne (1912), although he listed both Dec. 23 and the 24 dates described as if one event.

Milne quotes a letter dated 1855 Jan. 23, from a New Zealand engineer reporting a tsunami with the height shown accompanying first quake of a series in 1854-55. Milne (1908) reported that "motion in the sea" accompanied a small shock on 1855 Feb. 14 although there was no tsunami with the major quake, which (1912) he dated 1855 Jan. 23. Sieberg (1932) listed 1855 Jan. 23 as the date of the major shock and did not list the small shock or mention a tsunami. It seems probable that there was but one tsunami, but the date seems uncertain.

2 unusually heavy sea waves after last of 4 shocks.

## References

## Memoranda

Mallet, 1859  
Milne, 1908

Trask, 1864  
Holden, 1898  
H. Wood, 1916  
Heck, 1947



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1855 Nov. 11 Ansei 2 X 2		35.8 N 139.8 E	6.9 TAO		F	Tokyo Bay		Japan - Kunto Kazusa-no-Kuni Kisaraza Mibuchi Village			
*1856 --		Dampier Strait, New Guinea			C	Dampier Strait	1?	New Guinea, Dampier Strait Astrolabe Bay Geelvink Bay			
*1856 Feb. 15 or Feb. 16		San Francisco			M	California near San Fran- cisco	0?	California San Francisco	1±		
*1856 Mar. 2		Awu Is. (3.7 N 125.5 E)			T	Celebes Sea or Molucca Passage ?	1?	Indonesia Sangihe Is. Awu			
1856 July 26		Unimak Strait				Unimak Strait		Aleutian Is. - Alaska Pen. Unimak Strait			
*1856 Aug. 4					N	El Salvador to Nicaragua ?	1?	Honduras Omoa			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
Probably a seiche.	Omori, 1913	
Tsunami observed on both shores. Aralu village overwhelmed. Observed.	Sieberg, 1932	
"The water in the bay rose, maintained its level for five minutes, and then sank two feet below its ordinary stage."	Holden, 1898 Townley and Allen, 1939	
No details.	Sapper, 1929 Heck, 1947	
Agitation of the sea reported as well as sea quake. Probably different manifestations of sea quake and not tsunami. No quake listed by F. Wood (1964).	Sieberg, 1932	
Following shock which destroyed port, sea retired and returned again adding to damage.	Montessus de Ballore, 1888 Heck, 1947	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(July 23) *1856 Aug. 23 Ansei 3 VII 23	4:	42 N 141.1 E	6.9		H		2	Japan Hokkaido Oshima Pref. Hakodate Todohokke Sanriku Hachinohe, Shizukawa Otsuchi Yamada	73		
1856 Sept. ? Ansei 3 VIII 26					F	Tokyo Bay		Japan - Kanto Edo (Tokyo) and Vicinity			
*1857 May 13					T	Flores - Banda Seas	1 1/2?	Indonesia Timor Dili	3.3		
*1858 Nov. 13 (Dec. 13)					T	Banda Sea or Molucca Pass.	2?	Indonesia Celebes - E. Coast Banggai Is., Talaut Is. and Sengihe Is.			
?1858 Sept. ? ~1859 Jan. ? Ansei 5 VIII - ~XII -		Ryukyu Is.			E	Ryukyu Is.		Ryukyu Is. Okinawa I.			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Houses swept away and boats washed ashore.  Water retreated 1 mm., stranding boats. Said to have been shallower afterward.</p> <p>Waves bigger than in 1896 but velocities and effects smaller 5th wave largest.  Water passed over isthmus from Funakoshi. 38 houses swept away or wrecked. 21 deaths. July 23 date used in Ofunato-shi publication (Anon 1960) is unconverted Japanese date.</p> <p>Storm surge.</p> <p>Considerable damage.  Heck, following Wichmann gives date as Nov.13; Sieberg uses Dec. 13.</p> <p>Frequent quakes and abnormal tides.</p>	<p>Honda, 1908  Omori, 1913  Gondo, 1932  Imamura, 1934  Imamura and Musya, 1939  Heck, 1947  Imamura, 1949  Musya, 1951  Iida, 1956  Anon, 1960 (Otanato-shi)  Watanabe, 1964</p> <p>Gondo, 1932</p> <p>Wichmann, 1918  Sieberg, 1932  Heck, 1947</p> <p>Wichmann, 1918  Sieberg, 1932  Heck, 1947</p> <p>Musya, 1951</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1859 June 28</u>					T	Molucca Passage	3?	Indonesia Halmahera, W. Coast N. Celebes, Kema	9		
* <u>1859 July 29</u>					T	Molucca Passage or Celebes Sea	1?	Indonesia N. Celebes I. Kema and Manado			
(Aug. 23) * <u>1859 Aug. 25</u> (Sept. 3)					N	El Salvador	1?	El Salvador La Union			
* <u>1859 Sept. 24</u> (Oct. 18) 03:00		San Francisco			M	California near Half Moon Bay	1?	California Half Moon Bay	4.6		
* <u>1859 Sept. 25</u>					T	Banda Sea	1?	Indonesia, Moluccas Banda Neira Is.			
* <u>1859 Oct. 5</u> 11: _		Near Copiapo			P	Atacama	2?	Chile Caldera	5.5		

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

Moderate wave.

Wichmann, 1918  
Heck, 1947

Moderate wave.

Milne, 1912  
Wichmann, 1918  
Heck, 1947

3 ships destroyed.

Heck listed an alternate date Sept. 3, which was end of quake series. Milne used erroneous date of Aug. 23 for major shock and beginning of series.

Montessus de Ballore, 1888  
Milne, 1912  
Heck, 1947

Water "receded 15 feet and returned suddenly" or "left the bay for several seconds." Reports seem greatly exaggerated. Newspaper quoted by Holden gave the Sept. date; Ferrey was the source of the Oct. date. It's possible that the report refers to a California observation of the Chile tsunami of Oct. 5.

Holden, 1898

Wave of great force.

Wichmann, 1918  
Heck, 1947

Sea dropped 5.5 m, then swept back, damaging boats.

Montessus de Ballore, 1912a  
Heck, 1947  
Berninghausen, 1962

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1859 Oct. 25</u> or <u>Oct. 26</u>					T	Molucca Passage or Celebes Sea	1?	Indonesia N. Celebes, Kema			
<u>*1859 Dec. 8</u>					N	Guatemala - Nicaragua	1?	Guatemala - Nicaragua El Salvador Acajutla			
<u>*1861 June 5</u>					T	Java Sea?	1?	Indonesia, Java Krawang - Pakis			
<u>*1861 Oct. 21</u> Bunkyu 1 IX 18 04: _		37.7 N 141.6 E	6.4 TAO		G	Sanriku	2	Japan, Sanriku Rikuzen and Rikuchu Ryori (Kesen County)	4		
<u>*1862 Apr. 8</u>					T	Java Sea	1	Indonesia, Java Lenor	1.8-2.1		
<u>*1863 June 3</u> 19:25					U		1?	Philippine Is. Luzon Manila Adjacent Prov.		.1	
<u>*1863 Sept. 20</u> Bunkyu 3 VIII 8			5.9 TAO		W		0	Japan, Hokkaido Teshio (N. W. Hokkaido)			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
Damage by powerful wave.	Wichmann, 1918 Heck, 1947	
Waves at many places.	Rudolph, 1887 Milne, 1912 Heck, 1947	
Wave of great force.	Milne, 1912 Wichmann, 1918 Heck, 1947	
	Musya, 1951 Iida, 1956 Kawasumi, 1963 Watanabe, 1964	
	Wichmann, 1918 Heck, 1947	
Bore in Manila Bay described by 2 English frigates.	Monterru, 1887 Milne, 1912 Sieberg, 1922 Repetti, 1946 Heck, 1947	
Kaisho from daytime to 10 p. m.	Musya, 1951 Iida, 1956	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1864 May 23</u>					C		1 1/2	Malaysia, New Guinea Geelvink Bay	2.4-3.0		
<u>*1865 Mar. 1</u> Keio 1 II 4					E ?	Ryukyu Is.	1	Ryukyu Is. Okinawa			
<u>*1865 Nov. 18</u> 05:40 ?		Tonga			A	Tonga	0?	Tonga Is. Tau Cook Is.	1.2	3.7	
<u>*1867 Dec. 18</u>		Near N. Taiwan			D	Taiwan	2	Taiwan Keelung			
<u>*1868 Apr. 2</u> (Apr. 4)	Apr. 3 02:	Hawaiian Is. S. E. Hawaii Is.			R	S. E. Hawaii	4.1	Hawaiian Is. Hawaii S. Puna - Kau  Kealakekua Keauhou Hilo Oahu Honolulu California San Diego	8-20.0   2.4 12-15.0 3.0  1.5  0.1		7-8      15  30

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>3 waves.</p> <p>Small tsunami.</p> <p>Waves wrecked ship "John Wesley" on reef. Water level oscillations between 4 ft. below normal low tide and 4 ft. above normal high tide. No wave form noticed. Sieberg gives Cook Is. measurements as 4 m. instead of 4 ft.</p> <p>After quake, water ran out of harbor. Stranded junks swamped by returning wave or swept into town smashing houses. 100 dead.</p> <p>First wave swept away several villages. 108 houses destroyed. 81 deaths. 13 waves observed.</p> <p>Sea inundated for inland. Sea rose as quake ended. Minor damage.</p> <p>No details.</p> <p>No details.</p> <p>April 4 date was given by Milne.</p>	<p>Wichmann, 1918 Sieberg, 1932 Heck, 1947</p> <p>Imamura, 1949 Musya, 1951 Iida, 1956</p> <p>Rudolph, 1887 Sieberg, 1932</p> <p>Sieberg, 1932 Heck, 1947 Musya, 1951 Iida, 1956 Keimatsu, 1963 Kawasumi, 1963</p> <p>Coan, 1868, 1869, 1882 Bennet, 1869 Cumming, 1883 Alexander, 1891 Anonymous, 1896 Hitchcock, 1912 Milne, 1912 Wood, 1914 Westervelt, 1916 Jaggar, 1931 Powers, 1946a Heck, 1947 Shepard, a. o., 1950 Macdonald, 1952b</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Aug. 8) (Aug. 11) *1868 Aug. 13 (Aug. 14) Aug. 15) 17: _ ?	Aug. 13 16:45	18.5 S 71.0 W			P	N. Chile near Arica	4?	Chile  Arica  Pisagua Iquique  Valparaiso Constitucion Talcahuano Valdivia Peru Trujillo California San Diego San Pedro   San Francisco Oregon-Astoria Alaska- Kodiak Hawaiian Is. Hawaii - Hilo Maui - Kahului Oahu - Honolulu	14 21?  12  5  5  0.3  0.2  4.6 *3.6  2	0.5   0.5   5  11.9  12.9 18.9 22.0 14.2 14.6	16      21
Aug. 14											
Aug. 15								Japan Hokkaido - Hakodate Sanriku Izu-Shimoda Ryukyu Is. Naha Austral Is. - Rapa Samoa Is. - Apia Chatham Is. New Zealand - Lyttleton Australia - Sydney		25?	
Aug. 13 Aug. 14 Aug. 15										27± 10.9 16.0 15.0 19.0 23.7	

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Great "Peru" earthquake and tsunami. (Arica was at the time in Peru. Milne (1908) says tsunami caused 25,000 deaths.) Maximum wave, 2 hr. after quake, wrecked most ships in harbor. U. S. S. Waterlee carried 400 m. inland. Boats carried 300 m. inland. Recession of 8 m. Followed by waves, 1/2 hr. after quake, inundating city. No damage. Some damage.</p> <p>Some damage.</p> <p>Montessus de Ballore (1907) refers to a report by Schmick (1879) of a 21 m. runup at San Pedro. Gutenberg and Richter (1959) give the reported height as 18 m. and indicate it is most probably a mistake.</p> <p>Severe damage. Oscillations continued for three days. Considerable damage. Alexander (1891) gives date in Hawaiian islands as Aug. 15, 1868 and other Hawaiian publications erroneously report the year of occurrence as 1871.</p> <p>Water dropped 1 m., rose 1.5 m. More than 4 waves.</p> <p>16 or 17 oscillations in 4 hrs.</p> <p>Destroyed settlements.</p> <p>Dates are confused in some references. For example, Richter shows Aug. 8, Milne 1908 Aug. 11, and Iida Aug. 16 for quake. Aug. 14 and 15 shown by some authors are dates of tsunami observation at distant points, not date of generation.</p>	<p>Von Hochstetter, 1868, 1869  Coan, 1869, 1870, 1882  Fuchs, 1869  Hilgard, 1869  Anon., 1877  Schmick, 1879  Alexander, 1891  Montessus de Ballore, 1907, 1911a  Honda, a. o., 1908  Milne, 1908  Hitchcock, 1911, 1912  Milne, 1912  Anon., 1925  Jaggar, 1931  Sieberg, 1932  Bobillier, 1933  Powers, 1946a  Heck, 1947  Imamura, 1949  Shepard, a. o., 1950  Iida, 1956  Richter, 1958  Berninghausen, 1962  Kawasumi, 1963  Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1869 Jul. 25</u>		?			R*	?		Hawaiian I. Hawaii - Hilo S. E. Puna			
<u>?1869 Aug. 19</u> <u>Aug. 20</u> <u>*1869 Aug. 24</u> 13:10		Arica Ica ?			P Q?	N. Chile S. Peru	1?	Chile Iquique Pisagua Arica Callao	2		

# TSUNAMI DATA

## Effects and Remarks

16:45 local quake time is as given by Montessus de Ballore. Fuchs gives time as about 17:30. Travel times given by Hochstetter and Hilgard disagree in some cases, and travel times to Hakodate, Japan should probably be 27.5 hr. rather than 25 hrs. calculated by Milne and Honda, a. o. Milne (1908) particularly seems to contain several errors in time.

Moderate damage.

Wave swept 300 m. inland, destroying some houses attributed by Coan to date shown. Not reported by any other source and considered to be possibly a misdating of 1869 Aug. 19 Peru tsunami or 1868 Aug. 13 Peru-Chile tsunami, or possibly severe storm waves.

No details.

Sea sank 5 m. then rose 2 m. above normal.

No details.

?

The number and date of Peru--N. Chile tsunami occurring in August 1869 is uncertain. Berninghausen, citing Heck, Milne and Montessus de Ballore lists tsunamis accompanying a quake Aug. 19 at Ica and Arica and a quake (quakes?) on Aug. 20 and 24 at Tacna, Arica, Iquique, and Pica. Heck lists the same tsunami, not clarifying that the places were those at which the quakes, and not necessarily waves, were observed, citing Milne. Milne listed a quake at Arica and Ica on 19 Aug., accompanied by sea waves, citing an unidentified Montessus de Ballore report, and quakes Aug. 20-24 strongest at Arica, Iquique, & Pica, of which one at least was accompanied by sea waves, citing Fuchs, Montessus de Ballore, and Hope-Jones. Rudolph initially (1887) reported a quake at Tacna on Aug. 24 at 13:10 with which was associated the tsunami behavior at Pisagua noted above. Later, however, he quoted a ship captain's report from Pisagua on the same date that "...the inhabitants cleared out to the mountains leaving another sea wave." The earlier tsunami thus implied

## References

Coan, 1870  
Shepard, a. o., 1950

Fuchs, 1870  
Rudolph, 1887, 1895  
Montessus de Ballore, 1911a  
Milne, 1912  
Heck, 1947  
Berninghausen, 1962

## Memoranda

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1871 Mar. 2</u>		Sangihe I., Ruang and Tagulandang			T	Sangihe Is.	4?	Indonesia Sangihe Is. Tahulandang I. Buhias Ruang I.	25		
<u>*1871 Aug. 21</u> (Oct. 5)		Near Callao			O	Peru	1?	Peru Callao			
<u>1872 Jan. 26</u> 19:03		N.W.Luzon			U	N. W. Luzon	0	Philippine Is. Luzon-Agno			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>might have occurred on one of the earlier dates shown in Aug. 1869 or might easily have been the tsunami of 1868 Aug. 13. Montessus de Ballore included in his provisional lists (1910-11b) a quake at Arica and Ica on Aug. 19 that was accompanied by a tsunami, but later (1911a) in detailed account omitted this date and described a Peru-N. Chile quake on Aug. 24 accompanied by a tsunami at Arica and Iquique. Fuchs (1870) mentions a tsunami only on Aug. 24 accompanying a quake at Iquique and Arica. It is considered probable that there was only one tsunami in Aug. 1869, that on the 24th, but possible that there was an additional one on the 19th. (See also 1869 July 25.)</p> <p>Wave swept 200 m. inland, followed by 2 more. Much damage.</p> <p>Ships tossed about by waves, according to Fuchs. Montessus de Ballore and Sieberg connected the wave report, almost certainly mistakenly, with a N. Chile quake occurring on Oct. 5.</p> <p>Overflowing of the sea. Heck cites Maso as the source of tsunami information. However Rapetti (1946) who supposedly used all of Maso's information did not report waves accompanying quake.</p>	<p>Wichmann, 1918 Sapper, 1927 Sieberg, 1932 Heck, 1947</p> <p>Fuchs, 1872 Montessus de Ballore, 1911-12a Milne, 1912 Sieberg, 1932 Heck, 1947 Berninghausen, 1962</p> <p>Saderra, 1895 Heck, 1947</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1872 Mar. 14 Meiji 5 II 6		34.8N 132E	7.1 TAO		W	W. Chugoku	1	Japan, Chugoku Shimahe - Hamada			
?1872 Aug. 23 (Aug. 27)					R*	Unknown		Hawaiian I. Hawaii-Hilo	1.2		6
*1873 (Spring)		Maclay Co. New Guinea			C	Vilyaz Strait	1?	New Guinea Maclay Coast			
1873 Jul. 7		Chile Quillota (near Santiago) ?			E*			Ryulayu I. Kuyo			
*1875 Mar. 28		Loyalty I. or New Hebrides			B	Loyalty I. or New Hebrides	2?	Loyalty I. Lifu I.  New Hebrides Aneitgum I.  New Caledonia	4		

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

2 m. shoreline displacement of 20 km. of coast preceded quake by 30 min. Moderate tsunami followed.

Imamura, 1937  
Heck, 1947  
Imamura, 1949  
Iida, 1956

14 oscillations, decreasing. Associated by Sapper with eruption of Mauna Loa, and considered by Jaggar to be of local origin although no quake was reported. Possibly a tsunami of distant origin or possibly waves originating from atmospheric pressure disturbance. Powers (1946) followed Jaggar (1931) in ascribing this to Aug. 27 date.

Coan, 1872  
Sapper, 1927  
Jaggar, 1931  
Powers, 1946a  
Shepard, a. o., 1950

No details.

Sieberg, 1932

Unusual tide and well water changes. Month and day not noted. JMA correlation with S. America quake most unlikely.

Anon., 1961 (JMA)

? Milne, Kawasumi, and Japan Meteorological Agency (Anon., 1961) lists as site of tsunami effects but Sieberg lists only as place where quake was felt strongest.

Rudolph, 1895  
Milne, 1912  
Sieberg, 1932  
Heck, 1947  
Kawasumi, 1962

Waves washed over islets inside outer reef according to Rudolph.

? Listed by Milne and by Heck as site of quake and tsunami.

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1875 May 10		New Hebrides			B	New Hebrides		New Hebrides Eromanga I.			
?1877 Feb. 2 (Feb. 24)		S.W. Coast Hawaii			R	Hawaii?		Hawaiian I. Hawaii - Kona			
*1877 May 9 20:19	May 10 00:59	21.5 S 71 W			P	Chile near Iquique?	4?	Chile			
								Arica	20.0	<1	
								Talcahuano	23.0 15-18		
								Iquique	6	0.4	22
								Cobija	9		
								Mejillones	9	0.3	
								Caldera	11	0.5	
May 10								Peru	1.5		
								Callao		4.2	
								California - San Francisco	0.3	13.5	
May 11								Samoa I. - Apia	2-4	15	
May 10								New Zealand - Wellington	0.3	13.5	
								Hawaiian I.			
								Hawaii - Hilo	3.7-4.9	14.0	20
								Oahu - Honolulu		14.4	20
Meiji 10 May 11								Japan			
								Hokkaido - Hakodate	2.4	25.0	20
								Sanriku - Kamaishi	3	22.9	
								Boso - Kazuga		25.3	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Waves following quake rolled large stones up beach. May be same tsunami as Mar. 28.</p> <p>Associated by Sapper (who uses Feb. 2) and by Sieberg (who uses Feb. 24) with submarine eruption of Mauna Loa, which is most unlikely on the Kona coast.</p> <p>Great Chilean tsunami. Milne (1908) says heights reached 24 m. Geographic Magazine (Anon., 1877) records devastation at several guano ports with deaths and loss of ships. (Bobillier) Greater inundation than in 1868. All boats destroyed. Wateree shifted 3 km. (Berninghausen) (Heck and Berninghausen. May refer to Arica.) Much lower than in 1868 (Bobillier). (Milne, 1908). \$1.6 million damage. Bobillier (Milne, 1908). Great destruction. ("") ("")</p> <p>Heights reported by Milne (1908) are in error. 5 deaths; 37 houses destroyed; bridge swept inland; severe damage.</p> <p>Maximum amplitude 3 hrs. after arrival.</p> <p>Lives lost during period of maximum amplitude four hours after arrival. Times listed by Milne 1908 are in Greenwich astronomical time (GMT-12 hrs.).</p>	<p>Rudloph, 1895</p> <p>Sapper, 1927 Sieberg, 1932</p> <p>Anon., 1877 Geinitz, 1878 Fuchs, 1878 Coan, 1882 Cumming, 1883 Alexander, 1891 Milne, 1908 Honda, a.o., 1908 Milne, 1912 Hitchcock, 1911, 1912 Montessus de Ballore, 1911a Westervelt, 1916 Jaggard, 1931 Gondo, 1932 Bobillier, 1933 Powers, 1946a Heck, 1947 Shepard, a.o., 1950 Iida, 1956 Berninghausen, 1962 Kawasumi, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1878 Jan. 10</u>		Quake and erup- tion, new crater Yasowa volcano, Tanna Is. 19.5 S 169.4 E			B	New Hebrides	3?	New Hebrides Tanna Is. Port Resolution			
<u>?1878 Jan. 20</u>					R*	Unknown		Hawaiian Is. Maui, N. Coast Oahu, N. Coast			
<u>*1878 Jan. 23</u>		Arequipa- Iquique			O	Peru Chile Arequipa - Iquique	1	Peru Chile Arequipa-Iquique Piragua Arica			
<u>?1878 Jan. 27</u>					O*	Unknown		Peru Callao			
<u>*1878 Feb. 4?</u>		Eruption at Ruluan volcano			C	N. New Britain	1?	Bismarck Arch. New Brittain?			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Tsunami accompanied sea bottom rise of 3 m. maximum. Sapper does not mention quake. Milne and Sieberg do not mention eruption. Height is given variously as 17 m. by Sapper, 16 m. by Fuchs and Sieberg, and 12 m. by Heck.</p>	<p>Fuchs, 1879 Milne, 1912 Sapper, 1927 Sieberg, 1932 Heck, 1947</p>	
<p>Some houses wrecked. Some damage. Place of observation misspelled "Mani" by Fuchs and further misspelled "Manu" by Milne and Heck. Possibly large storm waves.</p>	<p>Fuchs, 1879 Milne, 1912 Heck, 1947 Shepard, a. o., 1950</p>	
<p>Town inundated. Town inundated. (See also 1878 Jan. 27)</p>	<p>Fuchs, 1879 Montessus de Ballore, 1911a Milne, 1912 Heck, 1947 Berninghausen, 1962 Kawasumi, 1963</p>	
<p>Vessels cast ashore by a larger tsunami than that of Jan. 23 according to Fuchs although there had been no new strong quake. Possibly confused with effects of Jan. 23 tsunami, because not reported by other authors.</p>	<p>Fuchs, 1879</p>	
<p>2 "flood waves", probably, two waves of a tsunami and not tsunamis as interpreted by Heck. Heck gives Feb. 4 date but Sapper says only that the waves occurred during eruption which lasted 4 days starting Feb. 4.</p>	<p>Sapper, 1927 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1878 Feb. 11</u>		Quake and eruption of Yasowa volcano Tanna Is.			B	New Hebrides	1?	New Hebrides Tanna Is.			
<u>*1878 Aug. 29</u>		Near Un- alaska			K	E. Aleutians near Unalaska	1?	Aleutian Is. Unalaska			
<u>1878 Oct. 11</u>					X	Tatar Strait		Sakhalin, W. Coast Due			
<u>*1879 Aug. 10</u>		San Fer- nando			M	S. California	0?	California Santa Monica			
<u>?1882 Sept. 7</u>		Ecuador ~ Colombia			N	Ecuador	1?	Ecuador Guayaquil			
<u>*1883 Aug. 26</u> 17:07		16.7 S 105.4 E Krakatoa volcano explosions			T	Sunda Strait	*	Indonesia Sumatra-Telok Batong Java-Merak Anjer	1.5	1-2	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Another eruption, quake, and tsunami apparently similar to those on Jan. 10.</p>	<p>Milne, 1912 Sapper, 1927 Sieberg, 1932 Heck, 1947</p>	
<p>Town of Makushin destroyed by earthquake and sea wave.</p>	<p>Holden, 1898 Heck, 1947 F. Wood, 1964</p>	
<p>Steamer "Batrak" thrown ashore by sudden wave and squall. Probably not a tsunami.</p>	<p>Solov'ev and Ferchev, 1961</p>	
<p>No details.</p>	<p>H. Wood, 1916</p>	
<p>Seismic wave according to Sieberg. Fuchs(1883) reported that no flood wave occurred in Panama. Quake data by Milne, who does not mention waves, suggests two quakes, one in Nicaragua; one extending from near Guayaquil to near Cartagena, with effects from either felt in Panama. Tsunami, if it occurred, must have been associated with latter.</p>	<p>Sieberg, 1932</p>	
<p>Camp swept away.</p>	<p>Anon., 1883 Fuchs, 1884 Verbeck, 1884 Evans and Wharton, 1888 Milne, 1912 Anon., 1925 Wilson, 1928a</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	Δ t	Period
* <u>Aug. 27</u> 01:42	Aug. 27 02:59							Sumatra-Telok Batong	10	1	122
* 05:30								Java-Sirik			
* 06:44								Java-Anjer			
* 10:02								Sumatra			
								Sumatra			
								Telok Batong	22		
								Vlakke Hock	15		
								Java			
								Tyringen	15-20		
								Merak	35		
	Batavia	2.4	2.5								
	Surabaya	0.2	11.9								

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Village submerged.  Almost entirely swept away.  Lower part of town overwhelmed.  Major explosion, 8 km.<sup>3</sup> of volcano blown away.  All towns and villages on Sunda Strait destroyed.  Warship carried 3 km. inland to 10 m. elevation.  All towns and villages on Sunda Strait destroyed.</p> <p>Many of the names of towns and villages of this region have changed since the departure of the Dutch from Indonesia.</p> <p>The small waves observed in the Pacific, as well as in other oceans, were generated by atmospheric pressure waves resulting from the major Krakatoa explosion and do not represent the true tsunami observed in the vicinity of the Sunda Strait.</p> <p>Few authors have noted that more than one tsunami was connected with the Krakatoa explosion.</p> <p>*No magnitudes have been assigned to the Krakatoa tsunamis because this mode of generation was different from that assumed in the definition of tsunami magnitudes.</p>	<p>Townsend, 1936  Heck, 1947  Imamura, 1949  Shepard, a. o., 1950  Ewing, and Press, 1955  Iida, 1956  Svyatlovski, 1957  Kawasumi, 1963</p> <p>Davidson, 1884  Fuchs, 1884  Milne, 1912  Sapper, 1927  Sieberg, 1932  Heck, 1947  Wood, F., 1966</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1884 Nov. 5</u>		W? Panama				Gulf of Panama?		Panama Aquadad (Aquaduce?) and Paconia			
1884 Nov. 15 Meiji 17 XI 15					F	Fiuchi Sea		Japan Okayama Bichu, Tamajima and Kasaoka			
<u>*1885 Nov. 19</u>		?			M	Unknown	1?	California San Francisco			
1887 Feb. 2		Panay I.			U	Philippine I.		Philippine I. Panay I.			
1887 Sep. 23								Philippine I. Tiburon and Jeremie			
(Mar. 12) <u>*1888 Mar. 13</u>		Explosive eruption, Ritter I. 5.5 S 148.1 E			C	Ritter I.	2?	New Guinea - New Brittain  Dampier Strait Coasts			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>No details. Places uncertain. May be Caribbean tsunami.</p> <p>Storm surge.</p> <p>Series of waves. Milne who cites <u>Nature</u> of unknown date, reports as if local quake on date shown accompanied by waves, but Heck, who cites only Milne, gives no date and says the waves were undoubtedly from a distant source.</p> <p>Tsunami reported by Heck citing Milne (1912). However Milne, reporting quake, mentions no waves and neither do Rapetti (1946) or Saderra (1895).</p> <p>Tsunami reported at these places by Heck. However, Tiburon and Jeremie are on S. coast of Haiti so this is a Caribbean, not Philippine tsunami.</p> <p>Great damage and some loss of life. Mar. 12 is given by Heck, who does not mention volcanic eruptions.</p>	<p>Sieberg, 1932</p> <p>Gondo, 1932</p> <p>Milne, 1912 Heck, 1947</p> <p>Heck, 1947</p> <p>Heck, 1947</p> <p>Sapper, 1927 Sieberg, 1932 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1889 May 26 02:23		Luzon and Mindoro			U?	S. China Sea?		Philippine Is. Luzon, Manila	0.1		
*1889 Sept. 9		Eruption Ruang volc. 2.2 N 125.4 E			T	Ruang, Sangihe Is.	1?	Indonesia Sangihe Is. Ruang			
*1892 Jun. 7 ~ Jun. 8		Eruption of of Awu volcano Sangihe I. 3.7 N 125.5 E.			T	Sangihe Is.	1?	Indonesia Sangihe I.			
?1892 Dec. 9 Meiji 25 XII 9 10:42	Dec. 9 01:42	36.4 N 136.3 E	6.5 CMO		W	W. Chubu		Japan, W. Chubu Noto Peninsula			
*1893 Jun. 4 Meiji 26 VI 4 02:27	Jun. 3 17:27	43.4 N 145.5 E	66 TAO ↑		H	Nemuro Peninsula	1	Japan, Hokkaido W. Coast Kuril Is. Shikotan Iturup, Slavnoe	2.5 2.8 1.5	20	20-30

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>May have been a river seiche according to description by Saderra.</p> <p>Eruption in progress when tsunami occurred. This is tsunami for which date in Heck is misprinted 1899 Sept. 8.</p> <p>No details.</p> <p>Abnormally high tide observed in both Toyama and Ishikawa Prefectures.</p> <p>5 waves. Solov'ev and Ferchev reported the quake time as 02:00 p.m. instead of 02:00 a.m. as listed by Central Meteorological Observatory (Anon. 1951).</p>	<p>Saderra, 1895 Rapetti, 1946</p> <p>Sapper, 1927</p> <p>Sapper, 1927 Heck, 1947</p> <p>Anon., 1954 (CMO) Iida, 1956</p> <p>Honda, a. o., 1908 Heck, 1947 Iida, 1956 Solov'ev and Ferchev, 1961 Kawasumi, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1894 Mar. 22 Meiji 27 XI 22 19:23	Mar. 22 10:23	42.3 N 145.1 E	7.9 CMO		H	Kushiro-Nemuro	2	Japan Hokkaido Nemuro Kushiro-Akkesi Hakodate Sanriku Kamaishi Taro Ayukawa	1.5 <3 3 1.5 0.4	0.33-0.5	20-30
*1896 Jan. 9 Meiji 29 I 9 22:17		36 N 141 E	7.3 TAO		G	Kashima Sea	0	Japan Kanto Tohoku, Ayukawa	0	1.0	8
*1896 Jun. 15 Meiji 29 VI 15 19:33	Jun. 15 10:33	39.6 N 144.2 E	7.6 TAO		G	Sanriku	4	Japan Hokkaido, Near Erimo Point Tohoku Mutsu Hachinohe N. Rikuchu Kuji Miyako S. Rikuchu Otsuchi Kamaishi Ofunato Ryori Bay N. Rikusen Onogawa Ichimomaki Ayukawa Sagami Aburatsubo Shikoku Hosojima	3-4.5 3-7.4 3.0 4-23 8.5 9.0 4.2 8.0 3.3 30 1-27 2.7 0.6 1.2 0.07 0.05	0.8 1.0 2.6	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Obs. ~ Mar. 23 02: ____</p> <p>Several waves continueing to (09?) - 23 Mar. 37 min. flood first.</p> <p>Great Meiji Sanriku tsunami. Disastrous, causing 27,122 deaths, with 9,247 injured. 10,617 houses swept away and 2,456 damaged.</p>	<p>Honda, a. o., 1908 Imamura, 1934 Imamura and Moriya, 1939 Heck, 1947 Imamura, 1948 Iida, 1956 Kawasumi, 1963 Watanabe, 1964</p> <p>Imamura and Moriya, 1939 Iida, 1956</p> <p>Anon., 1896 Honda, a. o., 1908 Davidson, 1921 Anon., 1925 Imamura, 1934 Imamura and Kawase, 1934 Anon., 1935 (Miyagi Pref.) Imamura and Moriya, 1939 Heck, 1947 Imamura, 1949 Shepard, a. o., 1950 Iida, 1956 Svyatlovski, 1957 Hatori, 1963a Kawasumi, 1963 Watanabe, 1964</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
								Hawaiian Is. Hawaii Hilo Kona coast Oahu-Honolulu California San Francisco	2.4 2.4-9.1 0.1 0.2	7.9 7.5 10.6	6 20 20-30
*1896 Dec. 17					M*	Unknown	0?	California Santa Barbara			
*1897 Feb. 20 Meiji II 20	20:20	38.1 N 141.5 E	7.8 TAO		G	S. Sanriku	0	Japan Sanriku Kinkazan Ayukawa	1 0.1		
*1897 Aug. 5 Meiji 30 VIII 5	00:10	38 N 143.7E	7.7 TAO		G	Sanriku	16	Japan, Tohoku N. Rikuchu Miyako S. Rikuchu Kamaishi Otuma Sakari N. Rikuzen Kesennuma Onagawa Ishinomake Ayukawa Kii-Kusimoto	1-2 1.2 1-3 1.5 1.5 2.3 1-3 1.3 3.0 0.5 1.0 0.15	0.3 1.9	10

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>No damage.</p>  <p>Date of tsunami given erroneously as Apr. 15 in Geographical Survey Institute publication (Anon. 1961) and as Dec. ____ by Gondo (1932).</p>  <p>No details. Source unknown.</p>  <p>At lighthouse.</p>      <p>Six waves.</p>	          <p>Wood, H., 1816</p>     <p>Milne, 1912 Heck, 1947 Anon., 1954 (CMO) Iida, 1956</p>    <p>Honda, a. o., 1908 Imamura, 1934 Imamura and Moriya, 1939 Heck, 1947 Imamura, 1949 Anon, 1954 (CMO) Iida, 1956, 1963 Kawasumi, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1897 Sept. 21 13:15	05:15	Sulu Is.			T	Sulu sea or Celebes Sea near Sulu Is.	1?	Philippine Is. Zamboanga (Mindanao)			
								Basilan	6		
								Sulu Is.-Solo	2		
								Dapitan			
								Negros			
1898 Apr. 23 Meiji 31 IV 23 08:30		39.5 N 143.6 E	7.8 TAO		G	Sanriku	-1	Japan Sanriku Ayukawa	0.1	1.0	23
(1899 Sept. 8)					(T)			Indonesia Sangihe Is., Ruang			
*1897 Sept. 10 21:40	21:40	00.0 N 140.0 W	8.6 PAS	Shal- low	L	Yakutat Bay	*	Alaska Yakutat Bay	10		
*1899 Sept. 30					T	Banda Sea	2?	Indonesia Ceram, S. coast	3-6		

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Greatest tsunami in Philippine history.  1st wave arrived after a 2nd quake at 15:15 (?). About 25 buildings wrecked.  Market destroyed. Some lives lost at ranches.</p> <p>11 waves, slow moving.</p> <p>Mistake for 1889 Sept. 9 (which see).</p> <p>Much of Disenchantment Bay and Russell Fiord uplifted &gt;5 m.; maximum 14 m. Outer part of Yakutat Bay subsided, maximum 2 m. near outer coast. Tsunami originated in Disenchantment Bay. Height attenuated rapidly in outer bay.  *Magnitude not assigned because waves were essentially restricted to so small an area.</p> <p>Disastrous. Many drowned.</p>	<p>Maso, 1910  Milne, 1912  Sieberg, 1932  Repetti, 1946  Heck, 1947  Kawasumi, 1963</p> <p>Omori, 1901</p> <p>Heck, 1947</p> <p>Tarr and Martin, 1912  Davison, 1936  Heck, 1947  Heck and Eppley, 1958  Wood, 1966</p> <p>Verbeek, 1899  Montessus de Ballore, 1907  Sieberg, 1932  Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1899 _____		E. Coast New Ireland			C	New Ireland	1?	Bismarck Arch. New Ireland, E. Coast			
1899 Nov. 25 Meiji 32 XI 25 3:40		Kyushu			E		-1	Japan Kyushu Hososhima	0.2		19.7
*1900 Sept. 11		New Britain			C	New Britain	0?	Bismarck Archipelago New Britain Blanche Bay Matupi Is.			
*1901 June 24 Meiji 39 VI 24	07:04	28.3 N 129.3 E	7.9 TAO	Shal- low	E	E. of Amami- Oshima	0	Ryukyu Is. Amami-Oshima			
*1901 Aug. 9 18:24 Meiji 39 VIII 9	09:24	40.5 N 141.5 E	7.7 TAO	Shal- low	G	Rikuchu	0	Japan, Sanriku Miyako Ayukawa Hawaiian Is. Hawaii - Hilo Kailua	0.6 0.2 1.2? 1.2	0.4	
*1901 Aug. 10 03:34 Meiji 39 VIII 10	Aug. 9 18:34	40.5 N 141.5 E	7.8	Shal- low	G	Rikuchu	0	Japan, Sanriku Ayukawa	0.25		

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
Several houses wrecked.	Sieberg, 1932	
	Omori, 1901	
No details.	Sieberg, 1932	
	Iida, 1963	
7 or 8 waves. Continued until masked by later tsunami.	Anonymous, 1901 Imamura and Moriya, 1939 Imamura, 1949 Shepard, a.o., 1950 Iida, 1963 Kawasumi, 1963 Watanabe, 1964	
3 surges covered wharf to depth of 1 m.	Imamura and Moriya, 1939 Imamura, 1949 Iida, 1963 Watanabe, 1964	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>?1901 Dec. 30</u>		Cook Inlet?			L	Cook Inlet?	?	Alaska Cook Inlet?			
(Feb. 2) <u>*1902 Feb. 26</u>		El Salvador			N	El Salvador	2?	El Salvador ~ Guatemala Acajutlla San Diego			
<u>*1902 Aug. 21</u>		S. W. Mindanao			T	Celebes Sea	0?	Philippine Is. Mindanao, Illama Bay			
(Oct. 6) <u>?1903 Oct. 8</u>					R	Hawaii		Hawaiian Is. Hawaii			
<u>*1904 June 25</u> (Apr. 25)	June 25 21:00	52 N 159 E	8.1 G8R	Shal- low	J	Near Petropavlovsk	1?	Kamchatka Avacha Bay			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Eppley's, Heck's and Wood's reports are based on Reid's report of a volcanic eruption on Cook inlet accompanied by a quake which caused several tidal waves. Gutenberg and Richter indicate that Redoubt volcano across Cook Inlet from Kenai erupted last in 1902, but no other as late as 1901. Quake is not listed by Davis and Echols, 1962.</p>	<p>Reid, 1911 Heck, 1947 Heck and Eppley, 1958 Wood, F., 1966</p>	
<p>185 deaths. Observed along 120 km. of coast. Much damage. Much damage and loss of life. Montessus de Ballore gave date as Feb. 2, citing Sapper, but both Sapper and Sieberg use Feb. 26.</p>	<p>Sapper, 1905 de Ballore, Montessus, 1907 Sieberg, 1932</p>	
<p>Telegraph cable broken. No details. Kawasumi (1963) lists only quake.</p>	<p>Sieberg, 1932</p>	
<p>A disturbance reported Oct. 6 by a ship at sea off Hawaii may have been sea quake or convection current but was not tsunami. Report coupled ambiguously with report of "tidal phenomena" at Kau and Hilo. Another report of tidal retreat at Punaluu (Kau) on the night of Oct. 8 with return in a rush covering wharf the following night. Accounts are obviously fanciful. Whether anything at all significant happened is doubtful.</p>	<p>Thrum, 1903 Wood, E., 1904</p>	
<p>Huge wave threw boats ashore. April date shown by Savarensky, a. o., is erroneous.</p>	<p>Sieberg, 1932 Heck, 1947 Gutenberg and Richter, 1954 Savarensky, a. o., 1958 Solov'ev and Ferchev, 1961</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1906 Jan. 31	Jan. 31 15:36	1 N 81.5 W	8.6 (G&R)	Shal- low	N	Ecuador - Columbia	1?	Columbia Tumaco Guapi California San Diego San Francisco Hawaiian Is. Hawaii - Hilo Oahu - Honolulu Japan Hakodate, Ayukawa Kushimoto, Hosojima	1      3.6 0.2	0.5 0.7     12.4 ~ 12.9 11.7	30 23
*1906 Apr. 18	Apr. 18 13:12	38 N 123 W	8.25 (G&R)	Shal- low	M	San Francisco	<0	California San Francisco		0.15 0.25 0.7	40
?1906 July 1		?			S?	?		Marshall Is.			
Aug. 7 *1906 Aug. 16	Aug. 17 00:40	33 S 72 W	8.4 G&R	Shal- low	Q	Talcahuano ?	2?	Chile Valparaiso  Coronel Penco and Tome Maule, Talca and Carico Prov. Hawaiian Is. Hawaii - Hilo Maui - Maalaea Kahului	      1.5 3.6	.25 ~ 1     16.7	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Tremendous waves caused havoc.</p> <p>Recorded. Recorded.</p> <p>Recession first. Height reported by Shepard a.o. probably refers to range.</p>	<p>Anonymous, 1906a Thrum, 1906 Rudolph and Szirtes, 1912 Ramirez, 1937 Heck, 1947 Shepard, a.o., 1950 Gutenberg and Richter, 1954 Anonymous, 1961 (JMA) Watanabe, 1964</p>	
<p>Great San Francisco earthquake. At Fort Point, sea dropped 0.1 m. Returned to normal. Start series of waves, amplitude = 5 cm. Omori, who first published a description of the waves, mistook the gauge scale and reported a 6 inch range.</p> <p>"Sea wave". Heck gives no details and gives only one incomplete and erroneous citation. No other author lists. Very doubtful.</p>	<p>Omori, 1907b Lawson, a.o., 1908</p> <p>Heck, 1947</p>	
<p>Great Valparaiso earthquake. Coast uplifted 0.7-0.8 m. intermittently for 350 km. No waves noted except strong surge at Punta Curaumilla. Waves soon after quake. Sea retreated, then quietly rose. Repeated 3 to 4 times.</p> <p>Flooded lowlands, little damage.</p>	<p>Thrum, 1906 Anonymous, 1906b Omori, 1907a Honda, a.o., 1908 Davison, 1936 Heck, 1947 Shepard, a.o., 1950 Berninghausen, 1962 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
								Oahu - Honolulu California San Diego San Francisco Japan Kushimoto Hakodate Auykawa, Misaki	0.1 0.1 0.2	15.1 13.8 23.8	25 22 21
*1906 Sept. 15 01:30 ±	Sept. 14 16:04	7 S 149 E	8.1 G&R	Shal- low	C	Dampier Strait	1?	New Guinea Huon Peninsula and Gulf Finschafen Tami, Siassi and Rooke Is. New Britain, W. Coast	1.5	0.2	
*1906 Oct. 2	01:30	2 N 152 E			C	Solomon Sea	0?	New Guinea Finschafen Buna Bay	1	2	
(Apr. 14) *1907 Apr. 15	Apr. 15 06:08	17 N 100 W	8.1 G&R		N	Acapulco	3??	Mexico Acapulco			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Date misprinted August 7 in Berninghausen.</p> <p>Widespread destruction. Oscillations continued until 10:00.</p> <p>Strong seismic wave associated according to Sieberg, with an aftershock of the Sep. 15 quake. Gutenberg and Richter (1954) do not list the aftershock. Heck listed the tsunami and associated it with a quake at 2N, 153E, but himself questioned this association.</p> <p>No details. Both Sieberg and Gutenberg and Richter give date as April 14, but Gutenberg and Richter show a quake time equivalent to early a.m. local standard time April 15. May be same as 9 m. wave reported by Heck, (1947) 1909 - Jul. 30.</p>	<p>Sieberg, 1910, 1932 Heck, 1947 Gutenberg and Richter, 1954</p> <p>Milne, a.o., 1913 Sieberg, 1910, 1932 Heck, 1947</p> <p>Sieberg, 1932 Gutenberg and Richter, 1954.</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1908 Sept. 20 20:15		Puna, Hawaii			R ?	Hawaii		Hawaiian Is. Hawaii, Hilo			
?1909 July 30	10:51	17 N	7.75 (G&R)	Shal- low	N	Acapulco		Mexico Acapulco	9		
*1911 May 8		New Britain			C		0?	Bismarck Archipelago New Britain Blanke Bay			
*1912 June 8	04:42	39.3 143.3		Shal- low CMO	F	Rikuchu	0	Japan, Sanriku Rikuchu			
*1913 Feb. 26		Westport, New Zealand			A	W. Coast, S. Island, New Zealand	0?	New Zealand South Island Westport			
*1913 Mar. 14	08:45	4.8 N 126.6 E			T	Molucca Passage	0?	Indonesia Sangihe Is. Talaut Is.			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Weak seismic sea wave according to Sieberg, who dates this event Sept. 21. Thrum's Almanac dates it Sept. 20 and gives the time of earthquake as 8:15 pm. (local time).</p> <p>Report by Heck who cites a British Association report (Milne,a.o., 1913). The latter, however, does not mention sea wave. It seems probable that this is the same tsunami as that reported by Sieberg (1932) and by Gutenberg and Richter (1954) as occurring 1907 Apr. 14 (See 1907 Apr. 15), because the authors did not mention a tsunami in 1909 and Heck did not mention one in 1907.</p> <p>No details.</p> <p>No details.</p> <p>Following quake, sea receded, then advanced over beach, threatening campers.</p> <p>See also 1914 March 14.</p>	<p>Thrum, 1908 Sieberg, 1932</p> <p>Heck, 1947</p> <p>Sieberg, 1932</p> <p>Iida, 1963</p> <p>Morgan, 1913 Heck, 1947</p> <p>Visser, 1921</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1913 Oct. 11</u>		7 S 148 E			C	Solomon Sea Near East end of New Guinea	1?	New Guinea Hawaiian Is. Oahu - Honolulu	0.1		17
* <u>1914 Jan. 12</u>		Near Callao			O	Peru	0?	Peru La Punta			
* <u>1914 Jan. 12</u> 18:29	09:29	31.1 N. 130.4 E	6.2 JMA		E	Kagoshima Bay	-1	Japan, Kyushu Kagoshima		1.5	
(1914 Mar. 14)					(T)			Indonesia			
* <u>1914 May 26</u>	14:23	2 S 137 E	7.9 G&R	Shal- low	C	N. Coast New Guinea	1?	New Guinea Hawaiian Is. Oahu- Honolulu			
* <u>1915 Nov. 1</u>	07:24	39 N 142.5 E	7.7 G&R	Shal- low	G		1	Japan, Sanriku Miyagi, Shizukawa	1		
* <u>1917 Jan. 25</u>		Near Amoy			U	Taiwan Straits	1?	China, Fukien Tungan			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
No record.	Heck, 1947 Shepard, a.o., 1950	
Small tsunami flooded hotels and naval school.	Anonymous, 1914 (BSSA) Berninghausen, 1962	
A small tsunami followed 1.5 hours after quake associated with eruption.	Omori, 1923	
Mistaken entry for 1913 Mar. 14.	Heck, 1947	
No record. Recorded according to Heck.	Heck, 1947 Shepard, a.o., 1950	
No damage.	Heck, 1947 Anonymous, 1954 (CMD) Iida, 1963 Kawasumi, 1963 Watanabe, 1964	
Waters following earthquake sink many fishing boats.	Keimatsu	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1917 May 2</u>  May 1	May 1 18:26	29 S 177 W	8.0 (G&R)	Shal- low	A	Kermadec Is.	1?	Samoa Is. Apia  Hawaiian Is. Oahu-Honolulu United States West Coast	0.1	7.9	20
* <u>1917 May 6</u>	May 6 12:19	23.2 N 121.6 E	5.8	Shal- low	D	Taiwan, E. Coast	-1	Taiwan Keelung	0.5	4.7?	26
* <u>1917 June 25</u>	June 26 05:50	15.5 S 173 W	8.3 G&R	Shal- low	A	Samoa	3?	Samoa Is. Upolu S. Coast Apia Sainili Tutuila Hawaiian Is. Oahu-Honolulu United States W. Coast	12 3.1 0.4	0.1	18
* <u>1918 Aug. 15</u>  Aug. 16  Aug. 15	Aug. 15 12:18	5.5 N 123 E	8 1/4 G&R	Shal- low	T	Celebes Sea	2.5 ?	Philippine Is. S. W. Mindanao Glan Lebak Japan, Kii Kushimoto Hawaii, Honolulu	7 2 0.2 <0.1	4.1	17

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

Recorded. 12 m. height reported by Heck is probably conferred with height of Jun. 25 tsunami.

Recorded. No details.

Height reported by Heck. Place unknown.

Destruction in several villages.

Destructive.

Destructive in Pago Pago.

Recorded.

Many deaths.

6 deaths.

Angenheister, 1923  
Heck, 1947  
Shepard, a.o., 1950  
Gutenberg and Richter, 1954  
Keys, 1957

Imamura and Moriya, 1939  
Imamura, 1949  
Iida, 1963

Angenheister, 1923  
Heck, 1947  
Shepard, a.o., 1950  
Gutenberg and Richter, 1954  
Keys, 1957

Maso, 1918  
Davison, 1921  
Sieberg, 1932  
Imamura and Moriya, 1939  
Heck, 1947  
Imamura, 1949  
Shepard, a.o., 1950  
Gutenberg and Richter, 1954  
Iida, 1956

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1918 Sept. 8</u> 02:16	Sept. 7 17:16	45.5 N 151.5 E	8.25 (G&R)	Shal- low	I	S. Kuril Is.	3.6	Kuril Is. Urup - E. Coast W. Coast Chernye Brat'ie Is. Iturup Shana Japan Hokkaido Nemuro Hanasaki Sanriku Hakodate Aburatsubo Kii-Kushimoto Shihoku, Hosozima Bonin Is. - Chichijima Hawaiian Is. Oahu Honolulu Hawaii Hilo Samoa Is., Apia California, San Francisco	12 2 1.5 2.6 2  1 0.3 to 1 0.5   0.03 1.4  0.3 1.5 0.2	30   30             7.1  9.7 9.5	30   30                 
Sept. 7											
* <u>1918 Nov. 8</u>	Nov. 8 04:38	44.5 N 151.5 E	7.75 G&R	Shal- low	I	Urup and Iturup	1	Kuril Is.			

TSUNAMI DATA	References	Memoranda																		
Effects and Remarks																				
23 deaths. Steamer wrecked.	Angenheister, 1923 Finch, 1924 Wilson, 1927a Imamura and Moriya, 1939 Heck, 1947 Imamura, 1949 Shepard, a.o., 1950 Keys, 1957 Sviatlovsky, 1957 Savarensky, a.o., 1958 Solov'ev and Ferchev, 1961 Iida, 1963 Watanabe, 1964																			
19 houses inundated, two bridges washed away.																				
Minor damage.																				
Insignificant wave.																				
Quake data are from Gutenberg and Richter. Central Meteorological Observatory (Anon. 1951) and Tokyo Astronomical Observatory (Kawasumi 1963) give the following:	Omori, 1923 Anonymous, 1951 (CMO) Iida, 1956 Solov'ev and Ferchev, 1961 Kawasumi, 1963 Iida, 1963 Watanabe, 1964																			
<table><tr><th>Agency</th><th>Time</th><th>N. Lat.</th><th>E. Long.</th><th>M.</th><th>Location</th></tr><tr><td>CMO</td><td>04:42</td><td>41.0</td><td>146.5</td><td>7.4</td><td>S. of Hokkaido</td></tr><tr><td>TAO</td><td></td><td>44.1</td><td>148.9</td><td>7.8</td><td>Off Iturup</td></tr></table>	Agency	Time	N. Lat.	E. Long.	M.	Location	CMO	04:42	41.0	146.5	7.4	S. of Hokkaido	TAO		44.1	148.9	7.8	Off Iturup		
Agency	Time	N. Lat.	E. Long.	M.	Location															
CMO	04:42	41.0	146.5	7.4	S. of Hokkaido															
TAO		44.1	148.9	7.8	Off Iturup															
Tsunami is listed by Central Meteorological Observatory (Anon., 1951) as observed in Chichijima, one of the Ogasawara group of the Bonin Is. (Cf. Chishima Shoto = Kuril Is.) It appears in Iida (1956) with CMO quake data, in Iida (1963) with CMO coordinates and time but TAO magnitude and location, and in Watanabe (1964) with G&R data. Solov'ev																				

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1918 Dec. 4</u>	Dec. 4 11:48	26 S 71 W	7.75 G&R	Shal- low	P	Near Caldera	2?	Chile Caldera	5		
* <u>1919 Jan. 1</u> ?	Jan. 1 02:59	19.5 S 176.5 W	7.75 G&R	180 ?	F*	Uncertain	?				
Jan. 2	?	?						Japan Shikoku - Hosojima Kii - Kushimoto Sagami - Aburatsubo	0.1 0.4	14.0? 14.4? 14.9?	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>and Ferchev question the tsunami occurrence and consider it a mistaken second listing of the Sep. 8 tsunami, stating that it did not appear in early Japanese lists. However, Omori (1923) lists both the Sep. 8 and Nov. 8 Kuril tsunamis, using them to amplify events repeated in the same area. In spite of the conclusion it is accepted here that both tsunamis occurred.</p> <p>Damage.</p> <p>This tsunami, recorded at the mareograph stations indicated was correlated by Imamura and and Moriya with the indicated intermediate, focus quake near Tonga. This correlation seems doubtful because: a) Tsunamis are rarely, if ever, associated with quakes of such deep focus; b) the travel times indicated are too great; c) no observations were recorded at intervening places whereas other Tonga tsunamis have had easily observed effects at nearby coasts; d) the relative times of arrival and heights at the several stations are not in accord with an approach from Tonga. The Japan Meteorological Agency (Anon., 1961) had correlated this tsunami alternately with a Philippine quake Jan 1, 01:34, 8N, 126E, M=7.4 (G&amp;R), shallow. The times of arrival are much harder to explain in this case, although the relative times of arrival at the stations are similar to those observed in the 1918 Aug. 15 Philippine tsunami.</p>	<p>Linneman, 1919 Berninghausen, 1962</p> <p>Imamura and Moriya, 1939 Imamura, 1949 Gutenberg and Richter, 1954 Iida, 1956 Anonymous, 1961 (JMA)</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(Apr. 9) *1919 Apr. 30 Apr. 29 Apr. 30	Apr. 30 07:17	19 S 172.5 W	8.3 G&R	Shal- low	A	Tonga	1	Tonga Is. Haapai Samoa Is. Upolu, Apia Hawaiian Is. Hawaii Punaluu Hilo Oahu, Honolulu California	2.5  0.4 ~1.2  0.6 0.1	0.6  0.9   10.2 6.5	     70 70 25
(1920 Aug. _ )		Samoa			A	Near Apia		Samoa Is. Tutuila, Pagopago			
?1920 Aug. 20		Chile 36 to 41S			Q	S. Chile		Chile Talcahuano			
*1920 Sept. 21	Sept. 20 14:39	20 S 168 E	8.0 G&R	Shal- low	B	New Hebrides	1?	Samoa Is. Upolu, Apia		4.4?	
?1921 Dec. 16		Unknown			?	Hawaiian Is. ?		Hawaiian Is. ?			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>3 recessions noted.</p> <p>Date of Apr. 9 given by Finch (1924), Wilson (1928), and Jaggar (1931) is incorrect.</p> <p>Heck's reference to an earthquake and tsunami are almost certainly mistaken. No quakes were recorded at Apia according to Keys (1957). The Apia record mentions no tsunami. Probably a confused re-entry of the Sep. 21 tsunami.</p> <p>Ships at anchor violently thrown about by consecutive movements of waves. As likely to have been a seiche or even a sea quake.</p> <p>Doubtful tsunami; listed only in Jaggar, 1946. No other reference.</p>	<p>Jaggar, 1919  Angenheister, 1923  Heck, 1947  Shepard, a.o., 1950  Gutenberg and Richter, 1954  Keys, 1957</p> <p>Heck, 1947</p> <p>Anonymous, 1921  Berninghausen, 1962</p> <p>Angenheister, 1923  Heck, 1947  Gutenberg and Richter, 1954  Keys, 1957</p> <p>Jaggar, 1946</p>	



[illegible]

TSUNAMI DATA

Effects and Remarks

References

Memoranda

Strong seismic wave.  
Observed, no details.

Great Atacama earthquake.

3 waves, 5 m. high, 2 km. inundation.  
7 waves. 0.6 km. inundation. Ships not driven ashore.  
Destroyed houses 4 blocks inland.

Minor damage.

Slight damage.

Sieberg, 1932

Finch, 1924  
Wilson, 1928a  
Willis, 1929  
Bobillier, 1933  
Heck, 1947  
Gutenberg and Richter, 1954  
Iida, 1956  
Keys, 1957  
Gutenberg, 1959  
Berninghausen, 1962  
Watanabe, 1964

[illegible]

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

3 waves. House washed away.

3 waves.

Settlement flooded. 2 deaths.

Recession stranded ship on harbor floor. Succeeding waves did \$1.5 million damage.

Recession first.

A total of seven waves. 3rd wave largest. 1 death.

Heck lists a Kamchatka tsunami on Feb. 23 associated with a quake at 55 N, 162.5 E. This may be a confused reference to the aftershock of Feb. 24 07:35 GMT, 56 N, 162.5 E, M=7.4. No Russian author reports a tsunami on either date, and it seems most probable that this report refers to the main Feb. 4 tsunami, which Heck describes only as observed in Hawaii. Sviatlovski reports a tsunami observation at Kolagir Bay and Ostrovna in March. No date or source are given, and the report is not repeated in later Russian reports including that by Savarensky a. o. of which Sviatlovski was one of the authors. This report is therefore considered to be but another reference to the Feb. 4 tsunami, which affected the places indicated.

Jaggar, 1923, 1926, 1929, 1930, 1931  
Novograblenov, 1923  
Marvin, 1923  
Finch, 1924  
Wilson, 1927, 1928a  
Wilson, 1928  
Imamura and Moriya, 1939  
Powers, 1946a  
Heck, 1947  
Imamura, 1949  
Shepard, a. o., 1950  
Gutenberg and Richter, 1954  
Keys, 1957  
Sviatlovski, 1957  
Savarensky, a. o., 1958  
Solov'ev and Ferchev, 1961  
Iida, 1963  
Kawasumi, 1963  
Watanabe, 1964

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1923 Apr. 14</u>	Apr. 13 15:31	56.5 N 162.5 E	7.2 G&R	Shal- low	J	E. Kamchatka	4?	Kamchatka Ust' Kamchatsk	20	0.3	
Apr. 13								Komandorski Is., Bering I. Japan	4		
								Hokkaido - Hanasaki	0.1	3.6	
								Sanriku, Ayukawa	0.2	4.2	
								Hawaiian Is.			
								Hawaii - Hilo	0.3	7.6	
								Oahu - Honolulu	0.2	6.6	38
								California			
								San Francisco	0.2	11.5	20
								San Diego	0.1	14.3	43
(May 4) ? <u>1923 May 7</u>	May 7 22:27	28.75 S 71.75 W	7 G&R 60		P	Chile		Chile Atacama			
* <u>1923 June 2</u>	June 1 17:25	35.75 N 141.75 E	7.2 G&R	Shal- low	G	Kashima Sea	-1.5	Japan, Sanriku Ayukawa	0.3	1.1	5
* <u>1923 Sept. 1</u>	Sept. 1 02:59	35.25 N 135.5 E	8.2 G&R	Shal- low	F	Sagami Bay	3.6	Japan Kanto Sagami Bay Atami Ito Misaki	12 9 2		

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

Second wave, 15 min. after first, destroyed 3 canneries, boats and many houses. One boat was carried inland 1 km. and deposited at an elevation of 20 m. Inundation to 8 km. in valley.

Voronov, 1923  
 Finch, 1924  
 Jaggar, 1926  
 Ulanov, 1931  
 Imamura & Moriya, 1939  
 Menlyailov, 1946  
 Powers, 1946a  
 Heck, 1947  
 Shepard, a. o., 1950  
 Sviatlovski, 1957  
 Solov'ev and Ferchev, 1961  
 Iida, 1963  
 Kawasumi, 1963  
 Watanabe, 1964

Kawasumi (1963) lists a tsunami with this quake and the Japan Meteorological agency (Anon. 1961) apparently copied the listing from an earlier edition but associated it with the next earlier date in Kawasumi's list (May 4). The tsunami does not appear in any other publication and is considered very doubtful.

Anon., 1961  
 Kawasumi, 1963

Imamura & Moriya, 1939  
 Iida, 1963  
 Watanabe, 1964

Great Taisho Kanto earthquake.  
 Large vertical displacements reported in Sagami Bay.  
 868 houses swept away.

Imamura, 1924  
 Suda, 1925  
 Davison, 1931  
 Imamura and Moriya, 1939  
 Heck, 1947  
 Imamura, 1949  
 Iida, 1963

Retreat first. Second wave largest. Fishing boats swept inland.

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>1923 Sept. 2</u>	Sept. 2 02:47	35 N 137.5 E	7.7 G&R	Shal- low	G	Boso	0	Tokyo Bay Yokosuka Chiba Boso Ainohama Shimizu Toba Koke Choshi Ishinomaki Hawaiian Islands Oahu - Honolulu	0.5~1.1	0.1 1.3	21
								Japan Chiba Katsuura Sunosaki Kanagawa Kamakura Izu Atami Ito	10.3 0.6 0.3	0.3 1.0 3.8 0.5 1.5	
Feb. 3 <u>?1924 Mar. 15</u> Apr. 13 Apr. 16	Mar. 15 10:31	49 N 142.5 E	7.0 G&R	Shal- low	X	Tatar Strait		Sakhalin Uglegorsk	0.3		
<u>*1924 Apr. 15</u>	Apr. 14 16:20	6.5 N 126.5 E	8.3 G&R	Shal- low	D	S. E. Mindanao	0?	Philippine Is. Mindanao Mati			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Hardly detectable by tide gauge.</p> <p>Small tsunami.</p> <p>Great agitation in river according to Ulanov. Sieberg who gives 3 dates in Feb. and Apr. without explanations, says that great damage resulted from flood waves, but this appears to be an exaggeration. More likely to be a seiche than a tsunami.</p> <p>No details. Coast sank 0.5 m.</p>	<p>Iida, 1963</p> <p>Ulanov, 1931 Sieberg, 1932 Solov'ev and Ferchev, 1961</p> <p>Maso, 1924 Sieberg, 1932 Kawasumi, 1963</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1924 May 30		Kilauea volcano?			R	Hawaii I.?		Hawaiian Is. Lanai, Kaunapau	5?		
*1924 Jun. 2		16.2 N 119.7 E			X	N. W. Luzon	1?	Philippine Is. N. W. Luzon Agno			
?1925 Oct. 4					M*	Unknown		California Long Beach	0.34		43
								Hawaiian Is. Oahu - Honolulu	0.04		20
?1925 Nov. 16	Nov. 16 11:55	18 N 107 W	7.0 G&R	Shal- low	Q	Mexico		Mexico Guerrero Zibuatanejo	10?		20
?1926 Mar. 16	Mar. 16 17:32	16.5 S 171 W	6 G&R	Shal- low	A?	Samoa??		Cook Is. Palmerston I			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Great damage reported (?). A tsunami generated off Kilauea volcano as postulated by Sieberg could not possibly be observed on Lanai without having serious effects elsewhere. Waves observed on Lanai were probably storm waves. Jaggar (1946) reports it as a tsunami with no details.</p> <p>Population terrorized by tidal wave but little or no damage resulted.</p> <p>Beginning 04:15 (12:15 GMT). Source unknown. Possibly of meteorological origin. Only tide gage records for this event exist.</p> <p>Town said swept by wave 35 ft. high. No confirmation from any other source. Report is doubtful and at the very least must be exaggerated.</p> <p>Tidal wave swept over island. Heck cites a report of 30 June that incident occurred about 3 months earlier. He associates it with quake indicated. There is, however, no Samoa report of a tsunami and no evidence of one on the Apia tide gage. Keys suggests connection with a storm centered 15 miles N. of Apia on 1 January.</p>	<p>Sieberg, 1932 Jaggar, 1946</p> <p>Anon., 1924 (BSSA) Kawasumi, 1963</p> <p>USC &amp; GS Tide Gage Records</p> <p>Heck, 1947</p> <p>Heck, 1947 Keys, 1957</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1926 Sept. 17 (Sept. 18)	Sept. 16 17:59	11.5 S 160 E	7.1 G&R 50	50	B	Solomon Is.	1?	Solomon Is. Guadalcanal Kokomaruki			
*1927 Mar. 7	Mar. 7 09:27	35.6 N 135.1 E	7.5 CMO 10	10	W	Tango, N. coast W. Honshu	0.4	Japan N. Kyoto Prefecture  Taiza (Tango) Tuiyama (at mouth of Maruyama River)	11.3 0.3	0.2	
*1927 Aug. 6	Aug. 5 21:13	38 N 142 E	6.9 CMO 20	20	G	Miyagi	<-2	Japan Miyagi - Shiogama Aomori - Hachinohe	0.1 1.0	0.7 1.0	25
*1927 Aug. 7		Eruption of Roka- tinda volcano Paloweah Island 8.6 S 121.7 E			T	Flores Sea	1?	Indonesia Paloweah Island and Flores Island N. coast			
*1927 Aug. 19	Aug. 18 19:28	34.2 N 142.0 E	6? Iida		G	Boso	<-2	Japan, Chiba Prefecture Cihoshi Mera	0.2 0.1	0.6 0.6	5 5

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Port inundated. 3 waves. Whole island inundated. Date shown is date of quake according to Gutenberg and Richter (1954). Heck gives date as Sept. 18 and Sieberg uses Greenwich date of September 16.</p>	<p>Sieberg, 1932 Heck, 1947</p>	
<p>Tango earthquake. Some land rose for 18 km. along fault preceding quake. Displacement to 0.6 m. No damage.</p>	<p>Imamura, 1928, 1937 Heck, 1947</p>	
<p>Recession first.</p>	<p>Iida, 1956, 1963 Watanabe, 1964</p>	
<p>226 deaths (by quake, eruption, or wave?). Sieberg gives date as 1928 Aug. 4 or 5, but Gutenberg and Richter, (1954) give year of last eruption of Rokatinda as 1927, tending to confirm Heck's date of 1927 Aug. 7.</p>	<p>Sieberg, 1932 Heck, 1947</p>	
	<p>Iida, 1956, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1927 Nov. 4</u>	Nov. 4 13:51	34.5 N 121.5 W	7.3 G&R	Shal- low	M	Point Arguello	1?	California San Francisco	0.05	1.6	12
								Surf La Jolla	1.8 0.06	1.2	11
								Hawaiian Is. Oahu - Honolulu	0.02		20
								Hawaii - Hilo	0.1	5.1	12
* <u>1927 Nov. 21</u>	Nov. 21 23:12	44.5 S 73 W	7.1 G&R	Shal- low	Q		1?	Chile Aysen			
* <u>1927 Dec. 29</u>	Dec. 28 18:20	55 N 161 E	7.3 G&R	Shal- low	J	E. Kamchatka	1?	Kamchatka Hawaiian Is. Oahu - Honolulu Hawaii - Hilo	0.03 0.06	7.7 7.8	20 17
1928 Mar. 31					P			Chile, Antofagasta Molito			
<u>1928 Apr. 27</u>	Apr. 27 20:35	13 S 69.5 W	6.75 G&R		O			Peru			

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
According to Wilson (1928a) the earthquake was felt at sea by American s/s "Socony" which was at the time at 34° 54' 34" N and 121° 01' 00' W.		Wilson, 1928a Jaggard, 1931 Powers, 1946 Heck, 1947 Shepard, a. o., 1950 Gutenberg and Richter, 1954 Anonymous, 1962	
Inundating to 150 m. along 40 km. of coast. Report of boat and crew being flung into treetops seems exaggerated.		Heck, 1947 Berninghausen, 1962	
No observations.		Wilson, 1928a Jaggard, 1930, 1946 Powers, 1946a Shepard, a. o., 1950 Sviatlovski, 1957 Savarensky, a. o., 1958 Solov'ev and Ferchev, 1961	
Huge waves reported sweeping over embankment. No mareographic confirmation known from near or distant stations. No quake reported by Berninghausen and none listed by Gutenberg and Richter (1954). Probably storm waves.		Berninghausen, 1962	
Coast scourged by high seas. No mareographic confirmation is known from near or distant stations. Quake was far inland. Probably storm waves.		Berninghausen, 1962	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1928 May 27	May 27 09:50	40 N 143.2 E	7.0 CMO	0-10	G	Iwate	<-2	Japan Aomori - Hachinohe Miyagi - Tsukikama Ishinomaki	0.1 0.1	0.7 0.7 1.4	
*1928 Jun. 16	(Jun. 17) 03:19	16.25 N 98 W	7.8 G&R	Shal- low	N		1?	Mexico, Oaxaca Puerto Angel Chakahua California - La Jolla - San Francisco Hawaiian Is. Hawaii, Hilo Oahu, Honolulu Samoa Is. Upolu - Apia	0.1 <0.1 0.21 0.05	8.4 9 14.7	12 16
Jun. 17											
(1928 Aug. 4) ~ Aug. 5)		Quake with erup- tion of Rokatinda volcano			T	Flores Sea		Indonesia Flores Paloeweh Island			
(Dec. 18) *1928 Dec. 19	Dec. 19 11:37	7 N 124 E	7.3 G&R			Celebes Sea	0?	Philippine Is. Mindanao Illana Bay			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>60 M inundation; destroying warehouses. 45 M inundation.</p> <p>See 1927 Aug. 7.</p> <p>No details. Sieberg gives December 18 date. Gutenberg and Richter (1954) say the quake was at time indicated. Heck and Bodle report the tidal wave swept up the Cotabato river to Cotabato, but this is doubtful because Cotabato is far inland.</p>	<p>Iida, 1956, 1963 Watanabe, 1964</p> <p>Wilson, 1928b Heck and Bodle, 1930 Jaggar, 1930 Powers, 1946a Heck, 1947 Shepard, a. o., 1950 Keys, 1957</p> <p>Sieberg, 1932</p> <p>Heck and Bodle, 1930 Sieberg, 1932</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1929 Mar. 6</u>	Mar. 7 01:34	51 N 170 W	8.1 G&R	50-60	K	Fox Is.	0?	Aleutian Is.  Hawaiian Is. Oahu - Honolulu Hawaii - Hilo	0.05 0.2	4.4 4.7	12 15
* <u>1929 May 26</u>	May 26 22:40	51 N 131 W	7.0 G&R	Shal- low	L	Heckate Strait?		British Columbia Queen Charlotte Is. Queen Charlotte City Skidegate			
* <u>1929 Jun. 13</u>	Jun. 13 09:24	8.5 N 127 E	7.2 G&R	Shal- low	D	Mindanao	0?	Philippine Is. E. Mindanao Hinatuan			
1930 Feb.											
? <u>1930 Dec. 28</u> - <u>Dec. 30</u>		Atacama?			P	Atacama?		Chile Coquimbo			
* <u>1931 Mar. 9</u>	Mar. 9 03:49	41.2 N 142.5 E	7.6 CMD	0	G	Iwate - Aomori	<-2	Japan Aomori - Hachinohe Miyagi - Tsukihama Fukushima - Onahama	0.2 0.1	0.9 1.8 1.9	28 27

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Earthquake felt at Dutch Harbor and seaquake felt by ships from 165° to 171° W. but tsunami apparently not noted.</p> <p>No details.</p> <p>Small tsunami following severe quake.</p> <p>High seas reported here and to the North for 500 km. Water reported green and malodorous. Quakes reported felt at Preirian (Freirina?) and Vallenar. No quake reported by Gutenberg and Richter (1954). Very doubtfully tsunami.</p> <p>Rise first. Drop first.</p>	<p>Jaggar, 1929, 1930, 1946 Powers, 1946a Heck, 1947</p> <p>Eppley, 1965</p> <p>Heck, 1947</p> <p>Anon., 1931 BSSA Berninghausen, 1962</p> <p>Iida, 1956, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1931 Oct. 4</u>	Oct. 3 19:13	10.5 S 161.75 E	7.9 G&R	Shal- low	B	Solomon Is.	1?	Solomon Is. San Christobal Hawaiian Is. Hawaii - Hilo Oahu - Honolulu	0.09 0.05	8.3	15 15
* <u>1931 Nov. 2</u>	Nov. 2 10:03	32.2 N 132.1 E	6.6 CMO	20	E	Kyushu Miyazaki	-0.3	Japan Shikoku Muroto Shimizu Kyushu Hososhima Aburatsu Kii Shionomisaki	0.4 0.3 0.3 0.3 0.1	0.7 0.5 0.5 0.5 0.8	
* <u>1932 Jun. 3</u>	Jun. 3 10:37	19.5 N 104.25 W	8.1 G&R	Shal- low	N	Jalisco Mexico	2?	Mexico Jalisco Cayutlan Manzanillo Nayarit San Blas  Hawaiian Is. Hawaii - Hilo Oahu - Honolulu Samoa Is. Upolu - Apia	0.4 0.08	6.9 7.7	18 10
* <u>1932 Jun. 18</u>	Jun. 18 10:12	19.5 N 103.5 W	7.8 G&R	Shal- low	N	Jalisco	1?	Mexico Jalisco, Manzanillo Hawaiian Is. Hawaii - Hilo	0.1		

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>18 villages destroyed. 50 dead.</p> <p>Powers (1946a) gives date of event Oct. 2, "London Times" as Oct. 4.</p> <p>Recorded.</p>	<p>Jones, 1931  Anon., 1932  Neumann, 1932  Gutenberg &amp; Richter, 1936  Powers, 1946a  Heck, 1947  Shepard, a. o., 1950  Gutenberg and Richter, 1954</p> <p>Iida, 1963  Hatori, 1963</p>	
<p>High waves swept away tracks between these two places.</p> <p>Partly swept by waves. Damages also at Guadalajara and Colima.</p> <p>Little or no damage.</p> <p>Recorded.</p> <p>Small tsunami.</p>	<p>Jones, 1931, 1932  Heck, 1947  Shepard, a. o., 1950  Gutenberg and Richter, 1954  Keys, 1957</p> <p>Jones, 1932  Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1932 Jun. 22</u>	Jun. 22 12:59	19 N 104.5 W	6.9 G&R	Shal- low	N	Jalisco	1?	Mexico Jalisco Cayutlan Manjanillo  Hawaiian Is. Hawaii - Hilo	< 0.1		
* <u>1932 Jun. 29</u>		Mexico?			N	Jalisco?		Mexico Jalisco - Cayutlan			
* <u>1933 Jan. 8</u>		Eruption of Kha- rinkotan volcano 49.2 N 154.5 W			I	N. Kuril Is.	3?	Kurile Is. Kharinkotan Onnekotan Paramushir	9		
* <u>1933 Mar. 3</u>	Mar. 2 17:31	39.1 N 144.7 E	8.3 CMO	0-20	G	Sanriku	4.8	Japan  Tohoku Mitsu Hachinohe N. Rikuchu Kuji Miyako	2.0-6.0 3.0 30-13.0 4.5 7.0 2.5-28.2	0.6	17

# TSUNAMI DATA

## Effects and Remarks

Severe damage.  
Some damage. Some people and smaller buildings were carried out to sea.

Tidal wave reported in Heck's list like 3 previous tsunamis in same month. There appears to be no mareographic confirmation of this one, and no quake is listed this date by Gutenberg and Richter (1954). Probably a mistaken entry.

No significant earthquake.

3 waves.  
3 waves.

Great Showa Sanriku Tsunami.

Casualties		Wrecked	
Killed	Injured	Houses	Vessels
30	70	264	631
1678	347	2229	} 5860
957	445	4615	

First motion up.

## References

Jones, 1932  
Heck, 1947  
Gutenberg and Richter, 1954

Heck, 1947

Solov'ev and Ferchev, 1961

Anon., 1933  
Jaggar, 1933  
Imamura and Kawase, 1934  
Ishimoto, a. o., 1934  
Miyabe, 1934  
Anon., 1935 (Miyage Prefecture)  
Neumann, 1935  
Imamura, 1937  
Jaggar, 1946, 1947  
Powers, 1946a  
Heck, 1947  
Imamura, 1949

## Memoranda

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Mar. 2								S. Rikuchu			
								Yamada	2.5		
								Otsuchi	3.5		
								Kamaishi	4.5		
								Ofunato	3.6		
								Ryori	24		
								N. Rikuzen	1.0-23.0		
								Kesenuma	2.5	1.1	9
								Onagawa	2.0		
								Ichinomaki	1.0	1.2	16
								S. Rikuzen	1.7-3.7		
								Fukushima	1.0-3.6		
								Hokkaido	1.8-9.1		
								Hakodate	0.9	1.3	28
								Kushiro	0.9	0.8	22
								Sagami - Aburatsubo	0.1	1.1	15
								Suruga - Shimizu		1.4	72
								Kyushu - Hosojima		2.4	
								Sakhalin			
								Honto (Nevelsky)		4.0	20
								Hawaiian Is.			
								Midway		4.5-6.5	
								Oahu - Honolulu	0.1	7.6	10
								Hawaii - Hilo	<0.1	8.6	
								- Kawaihae			
								- Kona	2.7-3.0		
								Samoa Is.			
								Upolu - Apia			30
								California			
								San Francisco	0.2	10.5	11
								Santa Monica	0.1		
								Los Angeles	0.2	11.5	14
								La Jolla	<0.1		11
Mar. 3								Chile			
Mar. 5								Iquique	0.4	22.0	
								Australia			
								Sidney		47.0	

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

### Casualties

### Wrecked

Killed Injured

Houses Vessels

344

162

First motion up.

1686

1307

First motion up.

12

41

64

7

13

56

61

311

First motion down.

First motion down.

Some damage.

10 large waves, last one largest. Some damage.

Reflection from American coast.

Shepard, a. o., 1950  
Gutenberg and Richter, 1954  
Keys, 1957  
Svyatlovski, 1957  
Richter, 1958  
Iida, 1963  
Hatori, 1963b, 1964  
Watanabe, 1964



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1933 Mar. 10	Mar. 11 01:54	33.6 118.0	6.25 G&R	Shal- low	M	Long Beach		California Long Beach	0.1		19
*1933 Jun. 19	Jun. 18 21:37	38.1 142.3	7.1 CMO	20	G	Miyagi	<-2	Japan Miyagi - Tsukihama Aomori - Hachinohe Hokkaido - Hakodate	0.1 0.1	0.4 1.1 1.0	20 15 30
1933 Dec. 26					D?	Philippine Is.		Philippine Is.			
*1934 Feb. 14	Feb. 14 04:00	17.5 N 119 E	7.6 G&R	Shal- low	U	Luzon, W. Coast	0?	Philippine Is. N. W. Luzon San Sebastian			
1935 Jul. 19	Jul. 19 00:50	36.7 N 141.3 E	6.5 JMA	0	G	Kashima Sea	<-2	Japan, Fukushima Onahama	0.1	0.3	12
1935 Oct. 13	Oct. 12 16:45	40.0 N 143.6 E	7.2 CMO	40	G	Iwate	<-2	Japan Aomori - Hachinohe Miyage - Kesenuma Fukushima - Onahama	0.2 0.1 0.1	0.7 0.7 1.2	12  7
*1935 Oct. 18	Oct. 18 00:12	40.3 N 144.2 E	7.1 CMO	20-40 CMO	G	Iwate	<-2	Japan Aomori - Hachinohe	0.1		

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

Uncertain records.

Wood, H., 1933

First motion up.

Iida, 1956, 1963  
Watanabe, 1964

Neumann reports a volcanic eruption, typhoon and tidal wave.  
No details of places or effects. The tidal wave was probably  
a storm surge.

Neumann, 1935

Small tidal wave.

Neumann, 1936  
Heck, 1947

First motion up.

Iida, 1956, 1963  
Watanabe, 1964

First motion up.

Iida, 1956, 1963  
Hatori, 1963b  
Watanabe, 1964

First motion up.

Iida, 1963

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1936 Jul. 13	Jul. 13 11:12	24.5 S 70 W	7.3 G&R	60+	P	N. Chile		Chile Taltal	.5		
*1936 Nov. 3 (Oct. 2)	Nov. 2 20:46	38.2 N 142.2 E	7.7 CMO	50-60	G	Miyagi	-1.6	Japan Aomori - Hachinohe Miyage - Kesennuma - Onagawa - Ishinomaki Fukushima - Onahama	0.1 0.3 0.1 0.1	1.1 0.6 0.6 0.9	32 22 30 40 21
?1936 Nov. 14	Nov. 13 21:23	55.5 N 163 E	7.2 G&R	Shal- low	J	E. Kamchatka		Kamchatka Ust' Kamchatsk			
1937 Sept. 21	Sept. 21 21:03	58 N 165 E	<6 G&R	Shal- low	J			Kamchatka Ust' Kamchatsk			
?1938 Mar. 7		8 S 165 E			B	Solomon - Santa Cruz Is.		Hawaiian Is. Oahu - Honolulu	<0.1		

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Sea level oscillations of about 1 m. for 1 hour after quake. May be simply a sea quake.</p> <p>First motion down. First motion up. First motion up. First motion up. Watanabe gives incorrect date of Oct. 2 (GMT).</p> <p>13 m. swell reported beginning at time of both earthquake and high wind. Solov'ev and Ferchev consider probably a tsunami but considering lack of distant mareographic effects this seems doubtful.</p> <p>Waves larger than in a force 10 storm poured across a spit. Solov'ev and Ferchev give 56 N, 162.5 E, M = 5.75 for quake. Considering small magnitude of quake and epicentral location, and apparent character of waves, doubts of Solov'ev and Ferchev that this was a tsunami seem supported.</p> <p>Arrival time 15:30. Amplitude of 3/4 to 1 in. seems too small to be certain of nature. No other reports found. Quake not listed in Gutenberg and Richter. Doubtfully a tsunami.</p>	<p>Anon., 1936 (BSSA) Berninghausen, 1962</p> <p>Miyabe, 1937 Iida, 1956, 1963 Watanabe, 1964</p> <p>Menyailov, 1938 Sviatlovski, 1957 Savarensky, a. o., 1958 Solov'ev and Ferchev, 1961</p> <p>Solov'ev and Ferchev, 1961</p> <p>Neumann, 1939</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1938 Mar. 22</u>	Mar. 22 15:22	52.25 N 132 W	6.3 G&R		L	Queen Charlotte Is.		California Santa Monica			
<u>*1938 May 19</u>	May 19 17:08	1 S 120 E	7.6 G&R		T	Strait of Macas- sar	1.5?	Indonesia Celebes, Mambara California Santa Monica	3 <0.1		
<u>*1938 May 23</u>	May 23 07:18	36.7 N 141.4 E	7.1 CMO	10	G	Ibaraki	-1.3	Japan Aomori, Hachinohe Miyagi, Onagawa Shiogama Fukushima, Onahama Chiba, Choshi	0.1 0.2 0.2 0.4 0.1	2.4 1.1 0.4 0.5	15 18 16 20 23
<u>*1938 Jun. 10</u>	Jun. 10 09:53	25.3 N 125.2 E	6.7 CMO	Shal- low	E	Ryukyu Is. Miyako Is.	0	Ryukyu Is. Miyakojima	1		
<u>*1938 Nov. 5</u>	Nov. 5 08:43	36.75 N 141.75 E 37.1 N 141.7	7.7 CMO	20	G	Ibaraki	-0.8	Japan Aomori, Hachinohe Iwate, Miyako Miyagi, Ayukawa Miyagi, Shiogama Fukushima, Onahama Chiba, Choshi Hokkaido, Hakodate Kashiro	0.1 0.2 0.5 0.6 0.5 0.1 0.4	1.5 0.9 0.7 1.5 0.4 0.6 0.6	22 25 20 27 21 18 25-40

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
<p>"Weak sea wave." Arrival time 03:00 does not seem to correspond to a tsunami from the quake indicated, and no intervening mareographic stations reported waves. Doubtfully a tsunami.</p>		<p>Neumann, 1939</p>	
<p>First motion up. First motion up. First motion up. First motion up. First motion up.</p>		<p>Neumann, 1939 Heck, 1947 Kawasumi, 1963</p>	
<p>First motion up. First motion up. First motion up.</p>		<p>Iida, 1956, 1963 Hatori, 1963b Watanabe, 1964</p>	
<p>First motion up. First motion up. First motion up.</p>		<p>Iida, 1963</p>	
<p>First motion up. First motion up. First motion up.</p>		<p>Iida, 1956, 1963 Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1938 Nov. 5</u>	Nov. 5 10:50	37.15 N 141.7 E	7.6 CMO	15	G	Fukushima	-0.8	Japan Aomori, Hachinohe Miyagi, Shiogama Fukushima, Onahama Chiba, Choshi Hokkaido, Hakodate	0.2 0.6 0.4 0.1	0.1 1.2 0.5 0.5	25 15 15 25
* <u>1938 Nov. 6</u>	Nov. 6 08:54	37.5 N 141.8 E	7.5 CMO	0	G	Fukushima	-0.6	Japan Aomori, Hachinohe Miyagi, Ayukawa Shiogama Fukushima, Onahama Chiba, Choshi Hokkaido, Hakodate Kushiro	0.1 0.6 0.4 0.2 0.1	1.4 0.6 1.5 0.4 0.6 1.7 1.2	10 15 11 11 10
* <u>1938 Nov. 7</u>	Nov. 6 21:39	37.0 N 141.1 E	7.1 CMO	0	G	Ibaraki	-0.7	Japan Aomori, Hachinohe Miyagi, Ayukawa Miyagi, Shiogama Fukushima, Onahama Chiba, Choshi	0.2 0.6 0.6 0.2 0.1	1.4 0.8 1.3 0.4 0.5	10  18 8 9
* <u>1938 Nov. 10</u>	Nov. 10 20:18	55.5 N 158 W	8.3 G&R	Shal- low	L	Shumagin Is. & Alaska Penin- sula	0?	Aleutian Is. Dutch Harbor Alaska Seward Sitka California - Santa Monica Hawaiian Is. Oahu - Honolulu Hawaii - Hilo	0.1  0.1 0.2	2.2  2.4 5.0	60  75 190
									0.1 0.3	5.0	30

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
First motion up.		Iida, 1956 Iida, 1963 Hatori, 1963	
First motion up.			
First motion up.			
First motion down.		Iida, 1956 Iida, 1963	
First motion down.			
First motion down.			
First motion down.			
First motion up.		Iida, 1956 Iida, 1963	
First motion up.			
First motion up.			
First motion up.			
		Anon., 1938 Neumann, 1940 Jaggard, 1946 Powers, 1946a Heck, 1947 Shepard, a. o., 1950 Gutenberg & Richter, 1954 Heck and Eppley, 1958 Wood, F., 1966	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1938 Nov. 14	(Nov. 13) 22:31	37 N 142.5 E	6.0 CMO	60	G	Fukushima	-1.5	Japan Fukushima, Onahama Chiba, Choshi	0.4 0.1	0.4 0.7	10 15
*1938 Nov. 22	Nov. 22 01:14	37.0 N 141.8 E	6.7 CMO 10	10	G	Fukushima	<-2	Japan Fukushima, Onahama Chiba, Choshi	0.1	0.6 0.7	6
*1938 Nov. 30	Nov. 30 02:30	37.0 N 141.8 E	7.0 CMO 5	5	G	Fukushima	<-2	Japan Aomori, Hachinohe Fukushima, Onahama Hokkaido, Hakodate	0.1 0.1 0.1	0.3 3.0	18 20 25
*1939 Mar. 20	Mar. 20 03:22	32.3 N 131.7 E	6.6 CMO 10	10	E	Kyushu Miyazaki	-0.3	Japan Shikoku, Murota	0.8		
*1939 April 30	Apr. 30 02:56	10.5 N 158.5 E	8.0 G&R	50	B	Solomon Sea		Solomon Is. Russel Is. Guadalcanal			
*1939 May 1	May 1 05:58	39.95 N 139.8 E	7.0 CMO 0	0	W	W. Tohoku Oga Peninsula	-0.7	Japan Akita - Ajigasawa Tsuchizaki Yamagata - Sakata	0.1	0.5 0.3 0.6	25 10 18

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>First motion up. First motion up.</p>	<p>Iida, 1956, 1963</p>	
<p>First motion down. First motion down.</p>	<p>Iida, 1956, 1963</p>	
<p>First motion down.</p>	<p>Iida, 1956, 1963</p>	
	<p>Iida, 1958</p>	
<p>12 drowned.</p>	<p>Aaron, 1961 (JMA)</p>	
<p>Oga Tsunami.  First motion down. First motion up. First motion up.</p>	<p>Kishinouye and Iida, 1939 Iida, 1963</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1940 August 2	Aug. 1 15:08	44.1 N 139.5 E	7.0 CMO	0-20	W	Sea of Japan between Hokkaido and Sikhote Alin	1.8	Japan Hokkaido Rishiri I. Teshio Haboro Ishikari Iwanai Honshu - Niigata Honto (Nevel'sky) Aleksandrovsk Primorskiy (Soviet Maritime Territory) Tetyuke Olga Vladivostok Korea	3 2 0.1 0.9 0.1 0.2  3.5 1	0.2 1.6 1.2  0.7	19 18
*1941 Nov. 19	Nov. 18 16:46	32.6 N 132.1 E	7.4 CMO	0-20	E	Kyushu Miyazaki	0	Japan Shikoku, S. W. coast	1.0		
*1942 Aug. 24	22:50	15 S 76 W	8.1 G&R	Shal- low	0	Peru, Ica	1?	Peru Callao Mantarani	1.6 0.5	0.7 1.7	30 21
*1943 Apr. 6	16:07	30.75 S 72 W	7.9 G&R	50-60	P	Coquimbo	0?	Chile Valparaiso Hawaiian Is. Oahu - Honolulu California Japan	0.5 0.01	0.4 15.5	18 20

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>More than 1,000 boats lost.</p> <p>Seven deaths.</p> <p>Mareograph amplitude = 0.2 m. Some flooding and damage. Recorded.</p> <p>Second wave highest. Considerable damage.</p> <p>Recorded.</p> <p>Extensive damage.</p> <p>Iida, 1963, misprints date as Nov. 9.</p> <p>Submarine landslide suspected.</p> <p>Oscillations continued for 36 hours.</p> <p>Recorded. No details.</p> <p>Recorded. No details.</p>	<p>Miyabe, 1940, 1941  Heck, 1947  Sviatlovski, 1957  Savarensky, a. o., 1958  Solov'ev and Ferchev, 1961  Iida, 1963</p> <p>Iida, 1963</p> <p>Bodle, 1944  Berninghausen, 1962</p> <p>Bodle, 1945  Heck, 1947  Shepard, a. o., 1950  Anon., 1961 (JMA)  Berninghausen, 1962  Iida, 1963  Watanabe, 1964</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1943 Jun. 13	Jun. 13 05:12	41.1 N 142.7 E	7.1 CMO	20	H	S. Hokkaido	0	Japan Aomori, Hachinohe	0.6		
*1944 Dec. 7 13:35	04:35	33.75 N 136 E 33.7 N 136.2 E	8.0 CMO	0-30	F	Kii	2.9	Japan Izu - Shinoda Suruga Shizuoka, Maisoka Ise-Wan, Ominato Kumano-ura Owase Wakayama Osaka Hawaiian Is. Oahu - Honolulu Aleutian Is. Attu - Massacre Bay Adak - Sweeper Cove California Terminal I. San Diego	2.0 to 2.0 0.8 2.0 2.0-7.5 5.0 to 4.0 0.3 0.1 0.3 0.1 0.1 0.1	0.9 8.3 5.4 6.4 13.9	21 10 12 16 14
*1945 Jan. 13 03:38	Jan. 12 18:38	34.7 N 137.0	7.1 CMO	0	F	Mikawa Bay	-0.7	Japan Aioki Senma	0.6		
*1945 Feb. 10 13:58	Feb. 10 04:58	40.9 N 142.1 E	7.3 CMO	30	G	Aomori	-1.5	Japan Aomori, Hachinohe	0.3		
*1946 Apr. 1	Apr. 1 12:29	53.5 N 163.0 W	7.4 G&R	Shal- low	K	E. Aleutian Is.	5?	Aleutian Is. Unimak I. Alaska - Yakutat - Sitka	30.5 0.2 0.4	2.9	8

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Tonankai tsunami. 3,059 houses wrecked. 998 deaths.</p>	<p>Iida, 1963 Watanabe, 1964</p> <p>Bodle, 1946 Omote, 1946 Heck, 1947 Iida and Ohta, 1961 Iida, 1963 Hatori, 1963b</p> <p>Inouye, 1950 Iida, 1963</p> <p>Iida, 1963 Watanabe, 1964</p>	
<p>Great (Eastern) Aleutian Tsunami. Wave arrived a few minutes after earthquake and destroyed Scotch Cap lighthouse. 5 dead.</p>	<p>Green, 1946 Powers, 1946a, b Jaggard, 1946, 1956 Heck, 1947</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
								Canada - Clayoquot	0.3	4.3	8
								Washington - Neah Bay	0.2	4.5	10
								California - Crescent City	0.9	4.6	12
								- San Francisco	0.3	5.5	15
								- Half Moon Bay	3.5		
								- Alameda	0.3		13
								- San Mateo	0.1		16
								- Santa Cruz	3.5		
								- Avila	1.2		16
								- San Luis Obispo	0.7	5.6	11
								- Port Hueneme	0.8		14
								- Los Angeles	0.4		6
								- La Jolla	0.3	6.2	11
								- San Diego	0.2		7
								Peru - Talara	0.5	14.5	15
								- Callao	0.6		13
								- Matarani	0.6		7
								Chile - Antofagasta	0.9	17.3	19
								- Valpraiso	0.8	18.1	18
								Hawaiian Islands			
								Hawaii - N. E. coast	3.5-17		
								Hilo	8.1	4.9	15
								Hawaii - W. & S. coasts	.5-6.5		
								Maui	2.0-6.7		
								Kahului	3.5		
								Oahu	0.5-10.5	1	
								Honolulu	0.6	4.6	15
								Kauai	2.5-13.5		
								Haena	13.5		
								Samoa - Apia	2.4	9.2	25
								Japan			
								Miyagi - Ayukawa	1.1	5.3	8
								Kamagawa - Aburazuko	0.8		12
								Wakayama - Kushimoto	0.7	6.4	10
								Hanasaki - Yezo Is.	0.3		13
								Hachinoe	0.3		13
								Iwate Prefecture	0.4		12
								Uchiura Bay			14

## TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

1 death.

173 deaths. Heavy damage.

68 deaths. 488 buildings demolished, 936 damaged. \$26 million damage.

3rd wave generally highest.

3rd to 6th waves highest.

California reflection  $t = 13.8$  hr.

Macdonald, a. o., 1947  
Bodle and Murphy, 1948  
Shepard, a. o., 1950  
Munk, 1953  
Gutenberg and Richter, 1954  
Keys, 1957  
Sviatlovski, 1957  
Iida, 1963  
Hatori, 1963a  
Watanabe, 1964



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1946 Dec. 21 04:19	Dec. 20 19:19	33.0 N 135.6 E	8.1 CMO	30	F	Nankaido Japan	2.4	Japan Honshu Izu - Shimoda Sieruga Shizuoka, Maisaka Ise Wan, Ominato Kumano Owase Wakayama, Fukuto Osaka Awaji Shima, Sumoto Shikoku Tokushima Tosa, Shimoda Ibari Hawaiian Is. Oahu - Honolulu California - San Francisco - Crescent City Peru - Talara	  3.0 2.0 1.0 1.2 5.5 2.0 6.1 1.6 0.9  4.6 3.5 2.7  0.1 0.1 0.3 0.1	              9.3 13.0 21.2	              14 12 14 11
*1947 Mar. 26	Mar. 25 20:32	38.75 S 178.5 E	7.0 G&R	Shal- low	A	North Island, New Zealand	0?	New Zealand Poverty Bay			
*1947 Nov. 4 09:09	Nov. 4 00:09	43.8 N 141.0 E	7.0 CMO	very Shal- low		W. Hokkaido	1.0	Japan Hokkaido - Wakkanai	2.0		
*1948 Jan. 25	Jan. 24 17:47	10.5 N 122 E	8.2 G&R	Shal- low	T	Iloilo Strait Panay, Philip- pine Is.	1?	Philippine Is. Iliolo Strait			

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
Nankaido Tsunami		Anon., 1947 (CMO) Anon., 1947 (ERI) Heck, 1947 Bodle and Murphy, 1948 Shepard, a. o., 1950 Gutenberg and Richter, 1954 Iida, 1958 Iida and Ohta, 1963 Iida, 1963 Hatori, 1964 Watanabe, 1964	
1,151 houses swept away. 1,500 deaths.			
No details.		Gutenberg and Richter, 1954	
		Iida, 1958, 1963	
2 deaths.		Murphy and Ulrich, 1951a	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
(1948 Apr. 6)					(P)	Chile		Chile			
								Japan			
*1948 Apr. 18 01:11	Apr. 17 16:11	33.1 N 135.6 E	7.2 CMO	40	F	Kii	-1.0	Japan - Kii Wakayama - Inami	0.5		
*1948 Sept. 9 Sept. 8	Sept. 8 15:09	21 S 174 W	7.8 G&R	Shal- low	A	Tonga	1?	Samoa Is. Tutuila - Pagopago Hawaiian Is. Kauai - Port Allen Oahu - Honolulu Oahu - Waianae	0.1 0.1 0.1 0.1	6.6	17 20 12 9
*1949 Aug. 21	Aug. 22 04:01	53.75 N 133.25 W	8.1 G&R		L	Near Queen Char- lotte I. British Columbia	0?	Alaska Ketchikan Sitka  Hawaiian Is. Hawaii - Hilo	0.3   0.1	5.3	16   20
?1949 Sept. 5	Sept. 5 02:54	18.5 N 122 E	JSA (Jesuit Seis- mologi- cal As- socia- tion)		D?	Babuyan Channel?		Philippine Is. Manila	0.1		17

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
Chile tsunami, recorded in Japan, listed under this date by Japan Meteorological Agency (Anon., 1961). No S. American records. Probably an erroneous re-entry of 1943 April 6 tsunami.	Anon., 1961 (JMA)	
	Iida, 1958, 1963	
	Murphy and Ulrich, 1951a Zerbe, 1953 Anon., 1961 (JMA)	
Unofficial warning issued by SSWWS.		
Sitka mareographic recordings mentioned by Murphy and Ulrich is not greater than background.	Murphy and Ulrich, 1951b Zerbe, 1953	
Uncertain record.		

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1949 Sept. 27	Sept. 27 15:31	59.75 N 149 W	7.0 G&R	50	K			Alaska Seward			
*1949 Oct. 20	Oct. 19 21:00	5.5 S 154 E	7.5 G&R	60?	B	Solomon Sea	0?	Bismarck Is. New Britain - Rabaul New Guinea Dregar Harbor Hawaiian Is. Hawaii - Hilo	0.1 <0.1 0.1	0.6	1.4 20 16
*1949 Dec. 29	Dec. 29 03:04	18 N 121 E	7.2 G&R	Shal- low	D?	Babuyan Channel?	1?	Philippine Is. N. Luzon, Mercedes			
*1950 Oct. 5	Oct. 5 16:10	11 N 85 W	7.7 G&R	Shal- low	N	Costa Rica	0?	Costa Rica Puntarenas Salvador La Libertad La Union Hawaiian Is. Hawaii - Hilo	0.1 8.9 <0.1 0.1	0.0	30 43 18
*1950 Oct. 23	Oct. 23 16:13	14.5 N 92 W	7.1 G&R	30 TAO	N	Guatemala	0?	Guatemala San Jose El Salvador - La Union Hawaiian Is. Hawaii - Hilo	0.2 <0.1 0.1	2.2 9.3	15 30 16

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
<p>"Gage shaken". This report in Zerbe's tsunami list probably refers to no more than the common oscillation of water in the stilling well of the gage as a result of the quake.</p>		Zerbe, 1953	
		Zerbe, 1953	
1 death.		Murphy and Ulrich, 1951b	
		Zerbe, 1953	
Unusual seiche.		Murphy and Ulrich, 1952 Zerbe, 1953	



TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Tokachi earthquake tsunami.</p> <p>91 houses swept away.</p> <p>Damage to port facilities.</p>	<p>Murphy and Ulrich, 1952 Zerbe, 1953</p> <p>Macdonald and Wentworth, 1951a, b. Murphy and Cloud, 1953 Zerbe, 1953</p> <p>Anon., 1952a (BSSA) Anon., 1952 (Volc. Lett.) Yoshida, a. o., 1952 Macdonald, 1952 Suzuki and Nakamura, 1953 Suzuki, a. o., 1953 Munk, 1953 Murphy and Cloud, 1954 Watanabe, 1956 Iida, 1963 Hatori, 1963b</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
								Washington - Neah Bay California Crescent City San Francisco Los Angeles Nicaragua San Juan del Luz Ecuador - La Libertad Peru Callao	0.1  0.2 0.6 0.8  0.1 0.1  0.3		32  25 27 33  13 22  43
*1952 Mar. 10	Mar. 9 17:04	41.7 N 143.5 E	7.0 CMO	0-20	H	S. E. Hokkaido	-2.5	Japan, Sanriku Hachinohe	0.2		
*1952 Mar. 17	Mar. 18 03:58	19.1 N 155.0 W			R	Hawaii I. off South Shore	0?	Hawaiian Islands Hawaii - Kalapana		0.0	
*1952 Mar. 19	Mar. 19 10:57	9.5 N 127.25 E	7.75 G&R	Shal- low	D	Mindanao Phillipines	0?	Palau Is. - Angauer Caroline Is. - Yap	0.7 <0.1	1.1 1.8	
?1952 May 13	May 13 19:32	10.5 N 85 W	7 PAS	100 CGS	N	Costa Rica	<-3	Costa Rica Puntarenas	<0.1	0.2	
1952 Jul. 13	Jul. 13 11:59	18.5 S 167.5 E	7 PAS	260 CGS	B	New Hebrides		Phoenix Is. Canton I.			

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
Warning issued by the Pacific Seismic Sea Wave Warning System.		
Local inundation to 180 m.	<p>Iida, 1958, 1963 Watanabe, 1964</p> <p>Macdonald, 1952 Anon., 1952b (BSSA)</p> <p>Zerbe, 1953 Murphy and Cloud, 1954</p>	
A single recession and recovery.		
<p>? Listings by Zerbe of a tsunami record at one station apparently refers to Canton record. However, no oscillations of tsunami character at appropriate time can be found, so there is no evidence to support tsunami generation.</p>	<p>Zerbe, 1953</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1952 Sept. 16</u>	Sept. 16 02:50	31.9 N 140.0 E			F	Myojin, Izu Is.	*	Japan			
* <u>Sept. 23</u>	Sept. 23 04:20	Explo- sions of					*	Izu Is.	0.3	0.5	1.5
* <u>Sept. 24</u>	Sept. 24 03:23	Myojin sub-					*	Hachijo I.	0.1		
* <u>Sept. 26</u>	Sept. 26 03:33	marine volcano							0.3		
									0.1		
* <u>1952 Nov. 5</u>	Nov. 4 16:58	52.75 N 159.5 E	8.25 G&R	30-60	J	E. Kamchatka	4	Kamchatka			
								Kamchatka Peninsula to Kronotsky Peninsula	0-5		
								Ust' Kamchatsk	0.1		
								Kronotsky Peninsula to Cape Shipursky	4-13		
								Olga Bay	13	0.7	
								Cape Shipursky to Cape Povorotny	1-10		
								Avachinskaya Bay	1.2	30	
								Cape Povorotny to Cape Lopatka	5-15		
								Khodutka Bay			
								W. coast - Ozernoe	5		
								Kuril Is.			
								Alaid I.	1.5		
								Shumshu I.	7-9		
								Paramushir I.	4-18.4		
								Severo - Kurilsk	15		
								Onkotan I.	9		
								Shiashkoton I.	8		
								Iturup I.	2.5		
								Komandorsk Is.			
								Okhotsk - Magadan	2		
								Sakhalin - Korsakov	1		

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
Explosion of Sept. 24 destroyed research vessel "Kaiyo Maru No. 5". Magnitudes not assigned because generation mechanism is different from that assumed in the definition of tsunami magnitude. See also 1953 Mar. 11 - 15.		Nakano, a. o., 1954 Miyoshi and Akiba, 1954 Miyoshi, 1960	
Great Kamchatka tsunami. Considerable damage and some loss of life. 2nd or 3rd wave highest.		Anon., 1952 Zerbe, 1953 Anon., 1953 (CMO) Macdonald and Wentworth, 1954 Murphy and Cloud, 1954 Watanabe, 1956 Keys, 1957 Sviatlovsky, 1957 Savarensky, a. o., 1958 Iida, 1958 Solov'ev and Ferchev, 1961 Berninghausen, 1962 Hatori, 1963a, b Iida, 1963 Cox and Mink, 1963	
3rd wave highest. Considerable damage.			
Considerable damage and some loss of life.			
Cutter thrown 500 m. back from shore.			
Disastrous. 1st or 2nd wave highest.			
2nd wave highest, destroyed most of town, and caused considerable loss of life.			

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Nov. 4								Japan			
								Hokkaido			
								Kushiro	0.5	1.8	120
								Hokodate	0.5	2.8	65
								Sanriku			
								Kuji	1.0	1.7	71
								Ishinomaki	0.9	2.3	
								Kii - Kushimoto	0.8	4.6	
								Mariannas Is.			
								Guam - Apra	0.1	5.4	21
								Palau Is. - Yap	0.1	6.1	14
								Caroline Is.			
								Truk	0.1	5.8	14
								Wake I.	0.3	4.2	7
								Marshall Is.			
								Kwajalein	0.3	6.0	14
								Eniwetok	0.2	5.4	9
								Hawaiian Is.			
								Midway Is.	1.0	4.4	12
								Kauai			
								Oahu	to 4.5		
								Honolulu	0.7	6.3	38
								Maui			
								Kahului		6.4	21
								Hawaii	to 6.1		
								Hilo	3.7	6.6	27
Nov. 4								Phoenix Is.			
								Canton	0.1	8.0	5
Nov. 5								Samoa Is.			
								Pagopago	1.0	9.7	18
Nov. 4								Apia		9.6	
								New Zealand	~1.0		
								Aleutian Is.			
								Attu - Massacre Bay	1.5		17
								Adak - Sweeper Core	1.1	2.5	48
								Unalaska - Dutch Harbor	0.6	3.5	58
								Alaska			
								Kodiak - Womens Bay	0.4	5.8	8
								Seward	0.2	6.3	37

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>\$0.8 - 1.0 million damage.</p> <p>Considerable damage on N. coast. Considerable damage on N. E. coast.</p> <p>Damage on N. coast.</p> <p>\$0.4 million damage.</p> <p>Some damage.</p>		

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Nov. 5								Alaska			
								Yakutat	0.3	6.4	15
								Juneau	0.2		75
								Sitka	0.3		4
								Canada			
								Tofino	0.3	7.7	20
								Victoria	0.2	8.7	30
								Washington			
								Neah Bay	0.2	8.0	21
								California	~1.4		
								Crescent City	1.1	8.0	18
								San Francisco	0.6	8.7	18
								Avila	1.0	9.0	18
								Port Hueneme	0.7	9.0	12
								Los Angeles	0.7	9.6	19
								San Diego	0.4	9.6	20
								Mexico			
								Acapulco	0.5	12.6	30
								Salina Cruz	0.6	13.7	22
								Guatemala - San Jose	0.3		18
								El Salvador - La Libertad	0.2		14
								Nicaragua - San Juan del Sur	0.2		17
								Costa Rica - Puntarenas	0.4	16.2	22
								Panama - Puerto Armuelles	0.2	16.1	
								Ecuador			
								La Libertad	0.2	17.8	14
								Peru			
								Callao	1.0	18.8	25
								Chile			
								Arica	1.2	19.8	17
								Valparaiso	0.9	21.4	22
								Tulcahuano	1.8	20.7	
*1953 Mar. 11 to Mar. 25		31.9 N 140.0 E Myojin volcano explosions			F	Myojin Sho, Izu Is.	*	Japan Izu Is. - Hachijo I.	~0.1	0.5	1.5

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
<p>Some damage.</p> <p>Some damage.</p> <p>Warning was issued by the Pacific Seismic Sea Wave Warning System.</p> <p>48 additional tsunamis generated by Myojin explosions and recognized on Hachijo mareograms. See also 1952 Sept. 16-26.</p> <p>*Magnitudes not assigned because generation mechanism is different from that assumed in the definition of tsunami magnitude.</p>		<p>Miyoshi and Akiba, 1954</p> <p>Nakano, a. o., 1954</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1953 Mar. 17</u>	13:04	50.0 N 156.5 E	5.75 SSI		I	Paramushir	1?	Kuril Is. Paramushir I.	1.5		
1953 Apr. 24	Apr. 23 16:24	4 S 154 E	7.5 PAS		B	New Ireland		Indonesia ?			
<u>*1953 Sept. 14</u>	Sept. 14 00:27	18.5 S 178.5 E	6.75 PAS	60	A	Kandavu Passage Fiji Islands	1?	Fiji Is. Bega I. Suva Samoa Is. - Pagopago Hawaii - Honolulu	1.5 3 0.2 <0.1	7.3	16
Sept. 13											
<u>*1953 Nov. 26</u> 02:48	Nov. 25 17:48	34.3 141.8	7.5 CMO	40-60	G	Boso	1.6	Japan Sanriku - Miyako - Ayukawa Chiba - Choshi - Mera Sagami - Ito Oshima I. Shizuoka - Hamamotsu Kii - Kushimoto Shikoku - Shimizu Aleutian Is. Attu - Massacre Bay Hawaiian Is. Midway	0.4 3 0.5 0.1 0.2 0.1 0.4 0.2 0.2 0.1 0.1	1.1 1.1 0.3 0.8 2.4 1.4 1.4 4.2 5.1	10 6 7 11 12 15
<u>*1953 Dec. 12</u>	17:31	3.5 S 81 W	7.8 PAS		O	Ecuador - Peru	0?	Peru Talara Ecuador La Libertad	0.1 0.2	0.1	

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

An error in the Hawaii Institute of Geophysics translation of Sviatlovsky gives the range as 3 ft. instead of 3m.

Statement of damage in list of tsunamis published by Japan Meteorological Agency (Anon., 1961) is probably a mistake. There is no confirmation of anything except quake effects.

(Five killed).

Wrecked or damaged boats.

Several deaths.

Murphy and Cloud list erroneously as occuring on Sept. 4.

Sviatlovski, 1957  
Solov'ev and Ferchev, 1961

Anon., 1961 (JMA)

Anon., 1954 (BSSA)  
Murphy and Cloud, 1955  
Houtz, 1960

Inouye, W., 1954  
Murphy and Cloud, 1955  
Iida, 1963  
Hatori, 1963b

Murphy and Cloud, 1955

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1955 Apr. 19	Apr. 19 20:24	30 S 72 W	7 PAS	30	P	Coquimbo	0?	Chile Coquimbo Tongoi Peru - Arica	1 1 0.5		
*1956 Mar. 6	Mar. 5 23:29	44.3 N 144.1 E	5.8 CMO	0-20	X	Abeshiri	-2	Japan - Hokkaido Abeshiri coast	0.2		
*1956 Mar. 30	Mar. 30 06:11	55 N 160.9 E			J	E. Kamchatka	0?	Kamchatka Wake I. Caroline Is. - Truk Aleutian Is. Attu - Massacre Bay Adak - Sweeper Cove Unalaska - Dutch Harbor Hawaiian Is. Midway I. Oahu - Honolulu Hawaii - Hilo Johnston I. California - Avila	0.1 <0.1 0.3 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	4.3	14 14
Mar. 29										1.8 2.1	20 18
											27
Mar. 30										2.1 6.1 6.3 7.2	15 30 16 11
											23
1956 Aug. 13	Aug. 12 16:59	33.8 138.8	6.5 CMO	40-60	F	Izu	-1	Japan			
*1957 Mar. 9	Mar. 9 14:22	51.3 N 175.8 W	8-8.5 PAS		K		3.5?	Aleutian Is.  Attu - Massacre Bay Adak - Sweeper Cove Unalaska - Dutch Harbor Unimak - Scotch Cove Alaska Kodiak - Womens Bay	0.6 4 0.7 12 0.2	1.1 1.4 2.2	7 27

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
Extensive damage at La Serena. Extensive damage.		Anon., 1955 (BSSA) Berninghausen, 1962	
		Brazee and Cloud, 1958 Iida, 1958, 1963	
No records known.		Brazee and Cloud, 1958	
Early reports of tsunami not confirmed.		Iida, 1963	
Warning was issued by the Pacific Seismic Sea Wave Warning System.		Anon., 1957 (BSSA) Keys, 1957 Richter, 1958 Salsman, 1959 Brazee and Cloud, 1959 Fraser, a. o., 1959 Cox and Mink, 1963	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
								Alaska			
								Yakutat	0.4	4.8	9
								Sitka	0.4	4.9	10
								Washington			
								Neah Bay	0.2	5.0	13
								Oregon - Astoria	0.1		23
								California			
								Crescent City	0.7	5.2	14
								Bodega Harbor	1.7	5.3	30
								San Francisco	0.2	6.0	11
								Avila	0.6	5.8	18
								Los Angeles	0.3	7.1	28
								Anaheim Bay	0.5	6.7	24
								La Jolla	0.3	6.6	14
								San Diego	0.2	6.9	18
								Mexico			
								Ensenada	0.6	6.8	13
								Acapulco	0.3	10.9	25
								El Salvador			
								La Union	0.1		22
								Acajutla			
								Guatemala			
								San Jose	0.1		14
								Costa Rica			
								Puntarenas	0.1		13
								Ecuador			
								La Libertad	0.4		20
								Peru			
								Talara	0.5	15.1	12
								Callao	0.2	16.2	21
								Matarani	0.7		7
								Chile			
								Valparaiso	1.2	18.4	8
								Talcahuano	0.9	19.0	24
								Hawaiian Is.			
								Midway	0.4	3.2	12
								Kauai	to 16		
								Nawiliwili	0.9	4.3	11
								Oahu			
								Honolulu	0.6	4.5	14

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
		Iida, 1963 Hatori, 1963a Van Dorm, 1963 Watanabe, 1964 Wood, F., 1966	
Minor damage.			
Minor damage.			
Several houses washed away on N. coast. Exceeded gage limit. Considerable damage on N. W. coast.			

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Mar. 10								Maui			
								Kahului	3.6	4.7	22
								Hawaii	2.7-9.8		
								Hilo	4.2	4.8	19
								Johnston I.	0.1	4.9	10
								Canton I.	0.2	7.5	12
								Easter I.	0.9	13.9	9
								Marshall Is.			
								Kwajalein	0.3	6.3	8
								Eniwetok	0.3	6.5	9
								Samoa Is.			
								Tutuila - Pagopago	0.3	9.1	22
								Upolu - Apia		9.0	25
								Japan			
								Hokkaido	1.8-3.0		
								Kushiro			
								Sanriku			
								Kii			
								Kushimoto	0.2		
								Mariannas Is.			
								Guam - Apra	0.1	6.7	54
								Wake I.	0.4	4.8	9
								Caroline Is. - Truk	0.2	7.2	14
<u>*1957 July 28</u>	July 28 08:40	16.5 N 99.0 W	7.9 CGS		N	Mexico	3?	Mexico			
								Acapulco	2.5		
								Salina Cruz	0.3		
<u>?1957 Oct. 31</u>					R*	Unknown		Hawaiian Is.			
								Midway	0.1		12

TSUNAMI DATA		References	Memoranda
Effects and Remarks			
<p>Considerable damage on N. E. coast.</p> <p>\$5 million damage.</p>			
<p>Considerable damage.</p>			
<p>Oscillation started at 19:00. No quake known. Possibly of meteorological origin. Similar oscillations with abrupt commencement are frequently recorded at Midway.</p>		<p>Brazee and Cloud, 1959</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1958 Jan. 19</u>	Jan. 19 14:07	1 N 79.5 W	7.4 PAS	40	0	Ecuador	2?	Ecuador Esmeraldas Guayaquil			
<u>1958 July 9</u> *	July 9 06:16	58 N 136.75 W	7.5 PAS	Shal- low	L	Lituya Bay S. Alaska	*	Alaska Lituya Bay	525		
?							-2	Yakutat	0.2	0.0	27
								Sitka	0.1	1.1	18
								Hawaiian Is.	0.1	6.7	15
								Hawaii - Hilo			
* <u>1958 Nov. 4</u>	Nov. 4 22:55	50° S 115° W	6.0 CGS		S	East Pacific Rise	?	Hawaiian Is. Midway	15.6	0.1	12
* <u>1958 Nov. 7</u>	Nov. 6 22:58	44.5 N 148.9 E	8.25 SSI		I	Iturup, S. Kuril Is.	2?	Kuril Is. Urup Iturup Shikotan Kunashir Japan Hokkaido Nemuro Hamanaka	to ~3 3 3-4 2-3 0.8 1.0	0.6	34

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
<p>Cutter sunk, 5 drowned, other damage.</p> <p>Damage. Iida, 1963, listing appears to be in error. No Japanese record is known.</p> <p>Warning issued by the Seismic Sea Wave Warning System.</p> <p>Wave generated by giant landslide into Gilbert Bay cleaned forest on opposite side of fjord to 525 m. height. Wave 100 m. high at mouth of fjord, dropped rapidly outside. 2 boats wrecked. 2 deaths. *Magnitude not assigned because of small area to which waves were essentially confined. Arrival time coincident with quake suggests that wave recorded at Yakutat (and other points in Pacific) was generated by crustal displacement independent of Lituya Bay wave.</p> <p>Considerable damage.</p>	<p>Anon., 1958 (BSSA) Brazee and Cloud, 1960 Berninghausen, 1962 Iida, 1963</p> <p>Anon., 1958 Miller, D. J., 1960 Brazee and Cloud, 1960</p> <p>Brazee and Cloud, 1960</p> <p>Anon., 1959 (BSSA) Brazee and Cloud, 1960 Solov'ev and Ferchev, 1961 Iida, 1963 Hatori, 1963b</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Nov. 6								Kinitappu	2.0		
								Kushiro	0.2	0.7	42
								Hakodate	0.3	0.9	40
								Monbetsu	0.2	1.7	
								Honshu			
								Hachinohe	0.5	1.4	
								Miyako			
								Choshi	0.2	1.5	
								Kushimoto	0.2	1.7	
								Kyushu			
								Aburatsu	0.2	2.4	15
								Hawaiian Is.			
								Midway	0.2	4.2	12
								Kauai - Nawiliwili	0.1	6.4	14
								Oahu - Haleiwa	0.1	6.4	8
								- Honolulu	0.1	6.7	23
								Maui - Kahului	0.3	7.2	19
								Hawaii - Hilo	0.2	7.3	20
Nov. 7								Wake I.	0.2	4.1	15
Nov. 6								Marshall Is. - Kwajalein	0.1	6.0	16
Nov. 7								Samoa I. - Pagopago	0.1	9.9	22
								Aleutian Is.			
								Attu I. - Massacre Bay	0.2	3.0	40
								Adak I. - Sweeper Cove	<0.1	2.0	15
								California - Port Hueneme	<0.1	10.5	12
								Peru - Talara	0.1	19.4	17
<u>?1958 Nov. 13</u>	Nov. 12 20:23	44.5 N 148.75 E	7.3 (PAS)	40 (CGS)	I	S. Kuril Is.		Kuril Is.			
								Aleutian Is.			
								Adak - Sweeper Cove	0.1	3.2	15
<u>*1959 Jan. 22</u>	Jan. 22 05:10	37.5 N 142.3 E	6.8 JMA	30	G	Fukushima	<-3	Japan Sanriku Miyako	0.1		

TSUNAMI DATA		
Effects and Remarks	References	Memoranda
Destruction of cultivated oyster rafts.		
Warning issued by Seismic Sea Wave Warning System.		
No records.	Brazee and Cloud, 1960	
Doubtful records. Warning was issued by the Pacific Seismic Sea Wave Warning System.	Eppley and Cloud, 1961 Iida, 1963	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
?1959 Feb. 7	Feb. 7 09:37	4 S 81.5 W	7.25 - 7.5 PAS		0	Peru - Ecuador		Peru Talara	0.2		22
*1959 May 4	May 4 07:16	52.5 N 159.5 E	8 PAS	60	I	N. Kuril Is.	0?	Kuril Is. Aleutian Is. Attu - Massacre Bay Hawaiian Is. Oahu - Honolulu Maui - Kahului Hawaii - Hilo	0.2 0.1 0.2 0.1	1.7 6.2 6.3 6.7	31 23 30 25
*1959 Oct. 26	Oct. 26 07:35	37.6 N 143.2 E	6.7 JMA	20	G	Miyagi	-3	Japan Sanriku Miyako	<0.1		
*1960 Mar. 24	Mar. 20 17:07	39.8 N 143.5 E	7.5 JMA	20	G	Iwate	-1	Japan Aomori - Prefecture Hachinohe	0.4		
1960 Mar. 23	Mar. 23 00:23	39.3 N 143.8 E	6.7 JMA	20	G	Iwate	<-3	Japan Aomori - Prefecture Hachinohe	0.1		
*1960 May 21	May 21 10:03	37.5 S 73.5 W	7.5 CGS		Q	S. Chile	0?	Chile Valparaiso Hawaiian Is. Hawaii - Hilo	0.3 0.1	14.7	17

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Oscillations shown by mareographic record mentioned by Eppley and Cloud and by Berninghausen began one hour before quake. Tsunami is questionable.</p> <p>No record known.</p> <p>Warning was issued by the Pacific Seismic Sea Wave Warning System.</p> <p>Generated by the largest foreshock of the May 22, 1960 quake in Chile.</p>	<p>Eppley and Cloud, 1961 Berninghausen, 1962</p> <p>Anon., 1959 (BSSA) Eppley and Cloud, 1961</p> <p>Iida, 1963</p> <p>Talley and Cloud, 1962 Iida, 1963</p> <p>Iida, 1963</p> <p>Eaton, a. o., 1961 Talley and Cloud, 1962</p>	



TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Great Chile tsunami. Tremendous damage and many casualties in Chile, Hawaii, and Japan. A warning was issued by the Seismic Sea Wave Warning System.</p> <p>200 persons lost. 130 persons lost. Devastation. 2 ships lost. Devastation on land.</p> <p>Almost complete destruction.</p> <p>Small.</p> <p>2 vessels lost. \$30,000 damage.</p>	<p>Anon., 1960b (Jap. Arch. Soc.) Duke, 1960 Iwasaki and Horikawa, 1960 Sievers, 1960 Symons and Zetler, 1960 Watanabe and Karzulovic, 1960 Weichert, 1960 Anon., 1961a, b Anon., 1961 (Chile) Eaton, a. o., 1961 Englert, 1961 Jordan, 1961 Kato, a. o., 1961 Nakamura and Watanabe, 1961 Ohya, 1961 Saint Amand, 1961 Takahasi, a. o., 1961 Anon., 1962b (Corps of Engineers) Anon., 1962c Magoon, 1962 Matlock, a. o., 1962 Miller, a. o., 1962 Nakano, H., a. o., 1962 Nakano, T., 1962 Talley and Cloud, 1962 Anon., 1963 (JMA) Cox, 1963 Cox and Mink, 1963 Hatori, 1963b Horikawa, 1963 Iida, 1963 Iida and Ohta, 1963 Keys, 1963 Popov, 1963 Vitousek, 1963 Sievers, a. o., 1963 Takahasi, 1963 Zetler, a. o., 1963 Hatori, 1964 Berkman and Symons, 1964 Wiegel, 1965</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
May 22								Oregon - Astoria	0.2	17.5	23
								Washington - Neah Bay	0.4	17.2	30
								British Columbia			
								Tofino	0.7	17.1	60
								Cape St. James	0.2	17.2	28
								Alaska			
								Sitka	0.6	18.4	20
								Yakutat	0.9	19.1	15
								Kodiak	0.7	19.2	
								Aleutian Is.			
								Unalaska - Dutch Harbor	0.8	19.7	30
								Adak - Sweeper Cove	1.5	19.5	18
								Attu - Massacre Bay	> 1.8	20.3	19
								Easter I.	6		
								Line Is. - Christmas I.	0.3	13.9	9
								Phoenix Is. - Canton I.	0.1	14.2	7
								Samoa Is.			
May 23								Upolu	to 4.9		
								Apia	1.5	12.3	8
								Tutuila	to 4.9		
								Pagopago	1.0	12.4	20
								Hawaiian Is.			
								Hawaii	1-10.5		
								Hilo	10.5	14.8	30
								Maui	2-4.5		
								Kahului	> 2.8	15.1	18
								Oahu	1-4		
May 24								Honolulu	1.0	15.4	33
								Kauai	1-4.5		
								Nawiliwili	1.7	15.5	15
								Midway	0.4	18.3	16
								Johnston I.	0.5	16.3	25
								Wake I.	0.5	18.4	14
								Marshall Is. - Kwajalein	0.4	18.2	19
								Caroline Is. - Truk	0.3	19.4	15
								Marianas Is. - Guam	0.2	21.5	30
								Ryukyu Is. - Nase	0.3	24.7	20
								Japan			
								Kyushu - Aburatsu	1.3	23.2	40
								Shikoku - Shimizu	1.5	23.1	20

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Some damage.</p> <p>\$50,000 damage.</p> <p>537 structures destroyed or severely damaged. \$22 million damage. 61 deaths, 282 injuries.</p>		

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1960 May 24	May 25 08:35	45 S 76 W	6.75 PAS		Q			Japan			
								Kinki - Kushimoto	2.2	23.1	25
								- Toba	1.6	23.5	60
								Chubu - Hamamatsu	1.1		
								- Shimoda	1.3		
								Kanto - Mera	1.3	22.4	20
								- Choshi	2.1		40
								Sanriku			
								S. Rikuzen	1.3-4.0		
								Shiogama	2.8	23.1	40
								N. Rikuzen	0.7-6.4		
								Onagawa	4.2	22.8	30
								S. Rikuchu	1.7-5.6		
								Ofunato	4.9		30
								N. Rikuchu	1.1-6.3		
								Miyako	1.2	22.6	40
								Mutsu	0.6-6.3		
								Hachinohe	3.3	22.4	50
								Hokkaido	0.4-5.0		
								Hakodate	2.2	23.5	50
								Kushiro	1.8	22.1	40
								Kuril Is.	to 4.7		
								Taiwan - Keelung	0.6	25.3	32
								China - Hong Kong	0.5	27.2	40
								Fiji - Suva	0.5	13.3	60
								New Zealand - Tauranga	0.6	13.2	50
								Lord Howe I.	0.3	15.6	22
								Australia - Cairns	0.3	19.8	25
								Tasmania - Eden	0.9	17.0	

# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

Dead & Missing	Structures wrecked or Washed away	Boats wrecked or Lost
84	2,259	3,986
85	2,105	2,626
6	153	485
24	368	437

A tsunami warning was issued in Hawaii on the basis of supposed tsunami observations accompanying the indicated after-shock of the main quake of May 22. No indications were seen in Hawaiian records, and it is supposed the S. American observations were merely of oscillations continuing from the main tsunami.

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
1960 Nov. 12	Nov. 13 09:21	51.4 N 168.8 W	7 PAS		K						
*1960 Nov. 21	Nov. 20 22:01	6.8 S 80.7 W	6.75 JMA	93	O	Peru	-1?	Peru Talara Chimbote Matarani Callao Hawaiian Is. Hawaii - Hilo Japan - Sanriku Miyagi - Onagawa	0.1 0.7 0.1 0.5  0.1	12.0	14
*1961 Jan. 16	Jan. 16 7:20	36.0 N 142.3 E	6.8 JMA	40	G	Ibaraki	-2	Japan Ibaraki - Onahama Miyagi - Ayukawa	0.2 0.2		
*1961 Jan. 16	Jan. 16 11:19	36.1 N 142.0 E	6.4 JMA	20	G	Ibaraki	-2	Japan Ibaraki - Onahama	0.2		
*1961 Jan. 16	Jan. 16 12:12	36.2 N 142.0 E	6.5 JMA	20	G	Ibaraki	-2	Japan Ibaraki - Onahama	0.2		
*1961 Feb. 27	Feb. 26 18:10	31.6 N 131.8 E	7.0 JMA	40	E	Miyazaki	-3/4	Ryukyu Is. Amami Oshima - Naze Japan Kyushu - Aburatsu - Hosojima Shikoku - Yawatahama Kanto - Aburatsubo	0.1   0.4 0.6 0.3	1.2   0.1  1.1 2.4	

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Tsunami warning issued in Hawaii owing to communications difficulties. Cancelled when reports from tide station indicated no waves.</p> <p>11 dead or missing.</p> <p>Recorded.</p>	<p>Talley and Cloud, 1962</p> <p>Hatori, 1963b</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1961 Jul. 23</u>	July 23 21:51	18.5 N 168.3 E	7 - 7.25 CGS		B	New Hebrides	0	New Hebrides Vila Forari	0.9 0.9		
* <u>1961 Aug. 12</u>	Aug. 11 15:51	42.8 N 145.6 E	7.3 JMA	80	H	Hokkaido	<-3	Japan - Hokkaido Nemuro	0.1		
* <u>1961 Nov. 15</u>	Nov. 15 7:17	42.8 N 145.7 E	6.9 JMA	60	H	Hokkaido	<-3	Japan - Hokkaido Nemuro	0.1		
? <u>1962 Mar. 12</u>	Mar. 12 11:40	8.1 N 82.9 W	6.75 CGS		N	S. Panama		Panama Puerto Armuelas  Galapagos Is. San Cristobal	0.1	2.7	
* <u>1962 Apr. 12</u>	April 12 00:53	38.0 N 142.8 E	6.8 JMA	40	G	Rikuzen		Japan - Sanriku Ayukawa	0.1		
* <u>1962 May 11</u>	May 11 14:12	17.0 N 99.6 W	7 PAS	40 CGS	N	S. Mexico	0?	Mexico Acapulco	0.8		
1962 Dec. 20	Dec. 21 08:43	52.4 N 168.5 W	6.75 PAS		K	Fox I. Aleutian Is.		Aleutian Is.  Adak			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Very slight irregular oscillation recorded immediately following quake. More regular brief oscillation 2 hours later.</p> <p>Warning was issued by the Pacific Seismic Sea Wave Warning System.</p> <p>0.1 m. oscillation reported by Honolulu Observatory began 4 3/4 hours too early to be tsunami and was not greater than background oscillations at other times.</p>	<p>Lander and Cloud, 1963</p> <p>Lander and Cloud, 1964</p> <p>Anon., 1962 (BSSA) Lander and Cloud, 1964</p> <p>Honolulu Observatory Records</p>	



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*1963 Feb. 13	Feb. 13 08:50	24.5 N 122.1 E	7.25 CGS	47	D	N. Taiwan	-2	Taiwan Hualien	0.2		
?1963 Mar. 30 - Mar. 31					L	Dixon Entrance?		British Columbia  Langara I. Wiah Point Port Simpson	} 4-5		
*1963 Oct. 12	Oct. 13 05:18	44.8 N 149.5	8 - 8.25 (SSI)	60	I	S. Kuril Is.	2?	Kuril Is.  Shikotan Kunashir Iturup Urup Simushir Matua Kamchatka Petrovsk Japan Hokkaido - Hakodate? Sanriku - Ofunato Kii - Kushimoto Marianas Is. Guam Hawaiian Is. Midway Kauai - Port Allen Oahu - Haleiwa - Honolulu Maui - Kahului Hawaii - Hilo Wake I. Johnston I. Line Is. - Christmas	1.2 1.0 4.0 4.4 1.0 0.9   1.2 0.6 0.5  0.1 0.3 0.3 0.3 0.2 0.4 0.4 0.2 0.1 0.1	5.8	14

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Disturbance listed by Von Hake and Cloud reached indicated heights above high water during night. No quake indicated. Questionable tsunami.</p> <p>Warning was issued by the Pacific Seismic Sea Wave Warning System.</p> <p>Light damage to U. S. N. ship positioned nearby.</p> <p>Recorded.</p>	<p>Von Hake and Cloud, 1965</p> <p>Von Hake and Cloud, 1965</p> <p>Anon., 1964 Solov'ev, 1965 Von Hake and Cloud, 1965</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
<u>*1963 Oct. 20</u>	Oct. 20 00:53	44.7 N 150.7 E	6.75- 7 (TAO)	25	I	S. Kuril Is.	3.5?	Marshall Is. - Kwajalein	0.2	5.8	14
								Caroline Is. - Truk	0.1	5.2	15
								Samoa Is. - Pagopago	0.1	9.6	14
								Aleutians Is.			
								Attu - Massacre Bay	0.4		
								California			
								Crescent City	0.5		
								Mexico - Acapulco	0.7		
								Kuril Is.			
								Shikotan	0.8		
								Kunashir	0.5		
								Iturup	to 8.0		
								Urup	to 15.0		
								Matua	0.4		
								Japan			
								Sanri - Hachinohe	0.3		
								Hawaiian Is.			
								Midway	0.2	4.6	15
								Oahu - Honolulu	0.1	7.1	14
								Maui - Kahului	0.4	6.5	10
<u>*1964 Mar. 27</u>	Mar. 28 03:36	61.1 N 147.7 W	8.4 CGS	33			5?	Hawaii - Hilo	0.1		18
								Society Is. - Tahiti	<0.1	12.0	11
								Marshall Is. - Kwajalein	0.1	6.4	15
								Caroline Is. - Truk	0.1	5.2	12
								Samoa - Pagopago	0.1	9.8	18

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
Warning was issued by the Seismic Sea Wave Warning System.	Anon., 1964 Solov'ev, 1965 Von Hake and Cloud, 1965	
Alaska (Prince William Sound) earthquake. With this major quake several local tsunamis were generated by shoreline and submarine slumping, and possibly submarine faulting in some cases, and a major tsunami was generated by the uplift of the continental shelf in the Gulf. The local tsunamis may exceed in number those listed here. For example there is evidence in Valdez Inlet for two independent slump sources of tsunamis. A tsunami warning was issued by the Seismic Sea Wave Warning System.	Anon., 1964 (CGS) Brown, 1964 Grantz, a. o., 1964 Kawasumi, 1964 Schatz, a. o., 1964 Van Dorn, 1964, 1965 Kachadorian, 1965 Plafker, 1965 Reimnitz and Marshall, 1965 Spaeth and Berkman, 1965	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
*					L	Valdez Inlet	*	Alaska - Valdez Inlet Valdez	to 30 6.1		
*					L	Passage Canal	*	Passage Canal - Whittier	to 9.2		
*					L	Knight Island Passage	*	Prince William Sound Chenega	16.6		
*					L	Resurrection Bay	*	Resurrection Bay Seward	9.2		
*					L	Gulf of Alaska	4.25				
								Alaska			
								Kodiak I.	to 20+		
								Kaguyak	9+		
								Old Harbor	9.2	0.8	
								Kodiak	6.1	0.8	
								Womens Bay	6.1	0.8	
								Afognak I.			
								Kenai Peninsula			
								Seldovia	1.2		
								Cordova	4.2		
								Cape Yakataga	3.7	0.7	
								Yakutat	2.2	1.4	7
								Juneau	1.1	3.2	81
								Sitka	2.4	1.5	50
								Ketchikan	0.6	2.8	29
								British Columbia			
								Prince Rupert	1.4	3.3	92
								Tofino	1.2	3.8	20
								Port Alberni			
								Washington			
								Neah Bay	0.9	3.7	22

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Disastrous to town, waterfront facilities, boats. \$15 million damage. Steamer Cheena almost capsized at dock. 31 deaths.</p> <p>\$10 million damage. 13 deaths.</p> <p>Village totally destroyed. 23 deaths.</p> <p>Disastrous to town, waterfront facilities, railroad, boats. \$14.6 million damage. 12 deaths.</p> <p>*Magnitudes have not been assigned to the local tsunamis because of the restricted waters in which they were generated. Major tsunami was generated by uplift of continental shelf over 700 km. length from off Sitkinak I. to Kayak I., in general to 2 or 3 meters but locally at Montague I. to 8 m. Corresponding subsidence of Kodiak I. and Kenai Pen. in general to 2 m.</p> <p>Alaska damages from major tsunami totalled \$44+ million. Deaths totalled 28.</p> <p>Great damage to towns, villages, canneries, fishing boats. Village totally destroyed. 3 deaths.</p> <p>Village almost destroyed. 1 death.</p> <p>Disastrous to town, waterfront, boats. \$31 million damage. 8 deaths.</p> <p>\$10.3 million damage.</p> <p>Great damage to villages and boats.</p> <p>Considerable damage to waterfront and boats.</p> <p>Considerable damage to boats.</p> <p>\$1.7 million damage to waterfront and boats.</p> <p>\$10 million damage.</p> <p>\$5 million damage.</p> <p>Minor damage.</p>	<p>Wiegel, 1965</p> <p>Coulter and Migliaccio, 1966</p> <p>Plafker and Kachadorian, 1966</p> <p>Von Hake and Cloud, 1966</p> <p>Wood, 1966</p> <p>Kachadorian and Plafker, 1967</p> <p>Pararas-Carayannis, 1967</p>	



# TSUNAMI DATA

## Effects and Remarks

## References

## Memoranda

\$0.6 million damage. 4 deaths.

\$9+ million total damage.

6 block section of city destroyed or badly damaged. Many boats wrecked. \$7 million damage. 11 deaths.

\$0.4 million damage.

\$53,000 damage.

\$15,000 damage.



Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
Mar. 27								Aleutian Is. Unalaska - Dutch Harbor	0.4	2.5	36
								Adak - Sweeper Cove	0.3	3.4	54
								Attu - Massacre Bay	0.4	3.8	72
Mar. 28								Kamchatka - Petropavlovsk	0.4	6.4	45
								Kuril Is. - Yuzhno	0.4	6.4	45
								Japan			
								Hokkaido - Hanasaki	0.3		
								Sanriku - Ofunato	0.7	7.1	40
								Kanto - Mera	0.3		
Mar. 29								Kii - Kushimoto	0.3		
								Shikoku - Shimizu	0.3		
								Kyushu - Aburatsu	0.4	10.4	
<u>*1964 May 7</u>	May 7 07:58	40.3 N 139.0 E	6.9 JMA	0	W	Akita Prefecture Japan	0	Japan W. Tohoku - Akita coast Hokkaido - Matsumae	41.0 0.3		
<u>*1964 Jun. 16</u> 13:02	Jun. 16 04:02	38.3 N 139.2 E	7.5 JMA	40	W	Niigata- Yamagata	2.5	Japan Hokkaido - Nakanai - Hakodate Aomori - Iwasaki Akita - Oga Yamagata Sakata Niigata Niigata Matsugasaki Shioya Sado I. Ishikawa - Usutsu Kyoto - Miyazu Shimane - Hamada Korea Ulsan	0.1 0.4 0.4 2.1 0.6-2.2 0.5 0.2-4.7 to 2.3 0.3 5.8 to 3.5 0.5 0.6 3.7 0.2	3.2 2.6 0.7 0.7	25 61 22

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
	<p>Anon., 1965 (JMA) Von Hake and Cloud, 1966</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1965 Jan. 24</u>	Jan. 24 00:11	2.4 S 126.0 E (SSA)	7.5 - 7.75 (PAS)	6	T	Indonesia Mollucas Sanana I.	2?	Indonesia Sanana I. Sanana Buru I. Namlea			
* <u>1965 Feb. 3</u>	Feb. 4 05:01	51.3° N 178.6° E	8-8.25 (PAL) 7.75 (PAS- BRK) 7.5 (CGS- ML)	40	K	Rat Is. Aleutians	.5?	Aleutian Is. Semya I. Attu - Massacre Bay Adak - Sweeper Cove Unalaska - Dutch Harbor Kodiak Japan Sanriku - Ofunato Hawaiian Is. Midway Kauai, N. coast Nawiliwili Oahu - Honolulu Hawaii - Hilo	10 3.2  0.2 <0.1  0.4 0.2 to 1.1 0.3 0.1 0.3	  3.0 0.6 0.2	
* <u>1965 Mar. 29</u>	Mar. 30 02:27	50.6 N 177.9 E	7.3 CGS		K	Aleutian Is.	-1?	Aleutian Is. Attu Hawaiian Is. Hawaii - Hilo	0.2  0.1	  5.4	
* <u>1965 July 2</u>	July 2 20:59	52.0 N 168.0 W	6.9 CGS		K	Aleutian Is. near Unalaska I.	<-1	Aleutian Is. Unalaska - Dutch Harbor	0.1		

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>90% of the city destroyed. 71 killed.</p> <p>City hit. No details.</p> <p>Warning was issued by Pacific Seismic Sea Wave Warning System.</p> <p>Warehouse flooded.</p>	<p>Lander, 1965 Von Hake and Cloud, 1967</p> <p>Lander, 1965 Von Hake and Cloud, 1967</p> <p>Von Hake and Cloud, 1967</p>	
<p>Warning was issued by the Pacific Seismic Sea Wave Warning System.</p>	<p>Lander, 1966 Von Hake and Cloud, 1967</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1965 Aug. 12</u>	Aug. 11 22:32	15.8 S 167.2 E	6.4 CGS		B	New Hebrides	1.5?	New Hebrides Tonga Vila	2.5 1		
* <u>1966 Oct. 17</u>	Oct. 17 21:42	10.7° S 78.7° W	7.5 (CGS)		O	Near Coast of Peru		Peru  Chimbote Callao Puerto San Juan Chile Antofagasta Valparaiso Talcahuano Ecuador - La Libertad Galapagos Is. California - San Diego - Crescent City Alaska - Snug Harbor Aleutian Is. - Adak Hawaiian Is. Hawaii - Hilo Maui - Kahului Oahu - Honolulu Kauai - Nawiliwili Samoa Is. - Pago Pago	 0.5 1.1 0.4  0.1 0.2 0.3  0.2 0.1 0.1 0.1  0.1 0.2 0.1 0.1 0.1	 1.2 0.9 1.1  2.4 3.6 5.1   10.1 12.1 20.8  12.3 12.6 12.8	 8 15 19  18 8 9   33 15   16 21 36
? <u>1966 Nov. 28</u>	No quake	reported.			B	Unknown		Santa Cruz Is. Mohawk Bay			
* <u>1966 Dec. 28</u>	Dec. 28 08:18	24.1 S 68.6 W	7.6 (CGS)		P	Antofagasta N. Chile		Chile - Caldera Hawaiian Is. Maui - Kahului Hawaii - Hilo	 0.2 0.1		

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Warning was issued by the Pacific Seismic Sea Wave Warning System. Damage reported at Casma nearby.</p> <p>Slight evidence on record.</p> <p>No details reported except arrival at 02:00 GMT.</p> <p>Motion recorded.</p>	<p>Von Hake and Cloud, 1967</p> <p>Berkman and Carrier, 1967</p> <p>Grover, N. C. (pers. comm.)</p> <p>Honolulu Observatory Record</p>	

Date	EARTHQUAKE DATA				TSUNAMI DATA						
	Time d-h-m	Epicenter	Mag.	Depth (km)	Reg.	Generating area	Mag.	Place of Observation	Height	$\Delta t$	Period
* <u>1967 Jan. 1</u>	1966 Dec. 31 18:23	11.8 S 166.5 E			B	New Hebrides	1?	New Hebrides Vanikoro Fiji - Suva	2 0.1		
* <u>1967 Jan. 1</u>	1966 Dec. 31 22:15	11.3 S 164.8 E			B	New Hebrides Vanikoro	0?	New Hebrides Vanikoro	0.8		
* <u>1967 April 11</u> 13:15	April 11 05:15	3.7 S 119.3 E	5	33		Mandar Gulf Indonesia		Indonesia Celebes (Sulawesi) Tinambung			
* <u>1967 April 12</u> 11:51	April 12 04:51	5.5 N 97.3 E	+100			Strait of Malacca Indonesia		Indonesia Sumatra - Sigli			
* <u>1967 Sept. 3</u>						Near Chimbote Peru		Peru - Chimbote			

TSUNAMI DATA	References	Memoranda
Effects and Remarks		
<p>Serious loss of life and property in coastal villages. Local reports of sudden recession followed by a rise. Thirteen fishermen drowned.</p> <p>Quake was followed by enormous water wave. No details.</p> <p>Recorded. No details.</p>	<p>Spaeth, M. S. (pers. comm.)</p> <p>Spaeth, M. S. (pers. comm.)</p> <p>Meteorological and Geophysical Service of Indonesia, 1967</p> <p>Meteorological and Geophysical Service of Indonesia, 1967</p>	



PRELIMINARY CATALOG OF TSUNAMIS OCCURRING IN THE PACIFIC OCEAN

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